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THE

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FEDERATED MALAY STATES.

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THE VISCOSITY OF RUBBER SOLUTIONS.

BY B. J. EATON.

During the last few years, several interesting papers on the viscosity of rubber solutions have been published, chiefly with a view to proving the existence of some relationship between the viscosity of such a solution and the strength or physical and mechanical qualities of the raw or vulcanised rubber.

If such a relationship be found to exist, we have a very useful and rapid method of ascertaining the value of any particular sample of rubber from one species such as Para (Hevea).

On theoretical grounds such a relationship might be expected to exist, especially if we accept the idea that rubber (caoutchouc) is built up of different polymers or, to use a less strictly scientific expression, different physical aggregates of the same substance, since the word "polymer" has a definite meaning in scientific language, whereas the actual existence of "polymeric" substances in raw caoutchouc is surmised but by no means proved. Each polymer or physical aggregate would possess a definite viscosity in solution at any particular concentration.

At the present stage it is not possible to state definitely whether there exists any correlation between such viscosity and the mechanical properties of the vulcanised rubber, since this has been both asserted and contradicted by different investigators.

Viscosity determinations carried out by the writer and other experimenters have however yielded results which are very suggestive and which appear to indicate such a relationship.

Thus, the deterioration of the physical properties and the production of "tackiness" in raw rubber by heat, light or chemical agents such as copper sulphate and other copper and metallic salts is indicated well by the results of viscosity determinations. The effect of excessive rolling on the washing machines is also indicated in the same way.

One of the most complete papers on the subject, which have been published hitherto is that by H. G. Fol, Chemical Engineer and Officer-in-Charge of the Government Rubber Testing Station, Delft, Holland, printed in the India Rubber Journal and also in French, German, and Dutch periodicals. This contains a critical survey of the methods proposed for the determination of viscosities and experiments showing the effects of various factors on the results obtained.

It is proposed to outline the experiments made and the conclusions deduced from these, and to offer a few criticisms based on the results of the writer's own work on the same subject. The results obtained by the writer and quoted on pages 52 & 53 of Bulletin 17 Department of Agriculture have now been calculated by both Schridowitz's and Fol's methods and are appended.

In the first place, the author is to be congratulated on his foresight in suggesting that viscosity determinations should be carried out at a temperature of 30°C, since workers in the tropics would have been unable to compare their figures with those obtained in temperate climates, for, as will be shown later, temperature has a marked effect on the results. It is often difficult in the tropics to carry out experiments at a lower temperature than that of the surrounding atmosphere, as ice or other methods of cooling are not always available, whereas it is always comparatively simple to raise and maintain a slightly higher temperature. (The average shade temperature in the laboratory in this country is about 27°C).

The experiments and observations may be summarised as follows :—

1. An examination of the various methods proposed for the determination of viscosities.
2. Conclusions as to the most desirable method.
3. Influence of size, etc., of viscometer on the results.
4. Influence of temperature.
5. Relationship between age of solution and viscosity.
6. Effect of different methods of preparation of the raw rubber.
7. Effect of method of preparation of the solution.
8. Method of calculation to be adopted as a standard.

The sample of raw rubber used in the experiments was a sample of plantation para crepe from Java, coagulated by means of acetic acid, and yielding the following analytical figures, which may be considered normal.

Water.	0. 1 per cent.
Mineral ash.	0. 3 per cent.
Resin.	3.1 per cent.
Protein.	1.35 per cent.

The conclusions drawn by the author on the results of his experiments are as follows :—

1. The use of the Ostwald capillary tube viscometer is recommended as the most suitable.

2. The dimensions of the viscometer have a considerable influence on the results obtained, so that the work of different experimenters is not comparable, unless a standard instrument is used.

3. The temperature at which the viscosity determinations are made has a marked effect on the results; increased temperature decreases the absolute viscosity, but the relative viscosity, *i.e.*, the viscosity of the solution at any temperature compared with the viscosity of the solvent at the same temperature is constant. No effect is produced by warming a solution and again cooling—the viscosity remains constant at the lower temperature when redetermined. A standard temperature of 30°C is recommended, to enable the results obtained by workers is the tropics to be compared with those obtained in temperate climates.

4. The age of the solution after preparation has a marked effect on the viscosity in some, but apparently not in the case of all rubbers. The viscosity of concentrated solutions of rubber decreases with age, and especially when exposed to light. In the case of very dilute solutions, little or no decrease occurs. The decrease may be caused by the aggregation and deposition of the finely divided insoluble particles in suspension, which cannot be filtered by ordinary methods. The decrease due to light, especially ultra-violet rays, proves that the suspended particles cannot be the only cause.

5. The mechanical treatment of the rubber before dissolving has a marked effect on the results.

The viscosity of solutions was found to decrease when the rubber was washed between rollers and converted to crepe, the decrease being more or less proportionate to the period of treatment.

6. It was found that partial solution of the rubber, by allowing samples to remain for an insufficient time in the solvent gave lower viscosities. Three theories are advanced to account for this phenomenon; (1) the resins, which have a lower viscosity than the caoutchouc dissolve more readily and are therefore present in greater proportion in a partial solution; (2) the caoutchouc may be a mixture of polymers, the lower of which having a lower viscosity, dissolve first and are therefore present in greater proportion; (3) the caoutchouc may be a mixture in varying states of aggregation of the same chemical substance.

It is therefore recommended that the rubber should remain in the solution till only the insoluble portion, protein, etc., remains in suspension and all the caoutchouc is completely dissolved.

7. Mechanical treatment of the solution, by shaking, etc., was also found to influence the results, the shaken solutions having a higher viscosity, which may be due to the larger proportion of small invisible particles which remain in suspension.

Another interesting point observed was the influence of the capillary bore of the viscometer on the results, the time of flow in second and subsequent observations being decreased.

8. A new method of calculating the absolute viscosity of a solution was given and that put forward by Schridowitz previously was criticized.

Conclusions:—The following modus operandi was recommended. Quantities of 1.00, 0.50, and 0.25, grammes of rubber are weighed out, after cutting into small pieces and drying in a vacuum dessicator and are dissolved each in 100 ccs. of pure benzene (B.P.80°C) in brown glass bottles. The solutions are shaken twice a day by hand and filtered through glass wool after 3 days. The solution is then allowed to stand for another day and if a deposit occurs, again decanted. The exact concentration of each solution is obtained by evaporation of an aliquot portion of each solution in a basin. After 4 days the viscosity of each solution is determined at 30°C in an Ostwald viscometer of standard dimensions. (*N.B.* The standard is not given.)

The efflux time is calculated from the mean of three observations in each case and the value reduced to relative viscosity. A viscosity curve is then drawn from the figures obtained on standard paper on which 1 cm. on abscissa = 0.1% concentration and 1 cm. on ordinate = 2 viscosity units. The "absolute viscosity" by Fol's method = Area (in square cms.) enclosed by abscissa, curve, and the ordinate at 1% concentration. (This is measured by a planimeter or by weighing, if standard paper is used.)

Criticisms :—

I agree with the author in his recommendation of the Ostwald viscometer as the most suitable instrument for carrying out viscosity tests and that a temperature of 30°C is the most convenient especially for workers in the tropics, where it may be difficult to obtain ice or other means of cooling the solutions. I am unable to agree with his proposal that the mean of three observations at each concentration, should be taken, on account of the decrease in viscosity caused by passing the solution through the capillary bore. This is not only very laborious, but merely introduces another unnecessary factor into the results. Again I am unable to agree as to the method of preparation of the rubber sample, a point on which many investigators are at variance.

In order to compare, for manufacturing purposes, any one sample with another, it appears to be more fair to dissolve each sample in the state in which it is used in the vulcanizing factory, *i. e.* all samples should be converted to thin crepe. For scientific purposes, this is unnecessary, since one may be comparing sheet with crepe, or thin crepe with thick crepe, or smoked with unsmoked, etc., in which case the samples should be only cut up and dried in a dessicator and subjected to as little mechanical treatment as possible.

It is obviously unfair to compare a piece of pure plantation crepe, which can be used directly, without further treatment in the factory, with a sample from a ball of Fine Hard Para which has to be steamed and softened and creped in heavy macerating machines and dried before it can be used, since if a comparison is made before such treatment it would be much more in favour of the latter rubber, and incorrectly so.

One factor which may cause the reduction of viscosity of partial solutions appears to have been overlooked by Fol, viz. that, when a sample is partially dissolved, nearly all the invisible insoluble fine particles are probably retained in the rubber structure till solution of the caoutchouc is complete, as the rubber is seen to retain its original structure, although swollen by the solvent, till the final stage of solution.

In the preparation of the rubber solution, I have found that accuracy is obtained by making an approximately 1 per cent. solution in pure benzol, in long cylinders, decanting or pipetting off the clear supernatant layer above the insoluble particles (filtering only when the solution appears turbid or opalescent) and estimating the rubber in an aliquot portion of the clear solution by evaporation in a flat porcelain basin. More dilute solutions are made by accurate dilution in narrow graduated cylinders (usually 10 or 20cc. cylinders) and the concentration calculated. The figures obtained invariably fall on the curve obtained from figures by making up separate solutions of each concentration as suggested by Fol, which is very laborious and unnecessary.

The method of calculation of results given by Fol has much to recommend it, as the tangent method of Schridowitz and Goldsborough, although in many cases it places samples of rubber in the same order of merit as Fol's method, is open to the objection that a tangent to the curves is difficult to construct accurately, as even a difference of one degree in the angle for curves of high viscosity solutions gives a great difference in the results. I believe the tangent method, if the curves were drawn with great accuracy, would give valuable results, but it involves the personal equation to too great an extent, whereas slight inaccuracies in the construction of

the curve, when Fol's method of calculation is used, have only a small effect.

Viscosity Results Obtained by the Writer.

I have appended to this review, the results of my own experiments given on pages 52 & 53 of Bulletin 17 Department of Agriculture, F.M.S., and have now calculated the absolute viscosities by both Schridowitz's and Fol's methods, adding the order of merit of the samples in a second table. It will be seen that quite a number of these coincide for both methods of calculation and many others nearly so.

The instrument used was an Ostwald viscometer having an efflux time for pure benzene of 20 seconds, the determinations being made at approximately 27°C, the ordinary laboratory temperature.

						Absolute viscosity Schridowitz's method.	Absolute viscosity Fol's method.
1	(a)	1.01,	0.76,	0.50,	0.25	162.0	69.5
	(b)	52.8 ,	23.4 ,	10.2 ,	3.6		
2	(a)	1.00,	0.75,	0.50,	0.25	83.3	53.5
	(b)	36.0 ,	17.4 ,	8.1 ,	5.1		
3	(a)	1.02,	0.76,	0 50,	0.25	93.0	57.3
	(b)	41.7 ,	18.6 ,	9.0 ,	3.6		
4	(a)	1.00,	0.75,	0.50,	0.25	80.0	54.0
	(b)	36.3 ,	20.7 ,	8.4 ,	3.3		
5	(a)	1.01,	0.76,	0.50,	0.25	108.0	57.5
	(b)	43.2 ,	19.8 ,	9.3 ,	3.6		
6	(a)	1.00,	0.75,	0.50,	0.25	86.6	49.0
	(b)	34.5 ,	16.5 ,	8.1 ,	3.3		
7	(a)	1 00,	0 75,	0.50,	0.25	94.0	55.2
	(b)	37.2 ,	19.8 ,	8.4 ,	3.3		
8	(a)	1.00,	0.75,	0 50,	0.25	126.0	51.6
	(b)	38.1 ,	17.4 ,	8.7 ,	3.3		
9	(a)	0.78,	0.39,	0.19		72.0	48.8
	(b)	10.5 ,	5.7 ,	3.0			
10	(a)	0.71,	0.35,	0.18		147.0	116.7
	(b)	35.1 ,	8.4 ,	3.3			
11	(a)	1.01,	0.76,	0.50,	0.25	19.5	19.6
	(b)	12.3 ,	7.8 ,	4.2 ,	2.4		
12	(a)	1.00,	0 75,	0.50,	0.25	72.0	47.3
	(b)	30.6 ,	17.1 ,	7.5 ,	3.3		
13	(a)	0.93,	0.70,	0.46,	0.23	58.0	40.2
	(b)	22.5 ,	12.3 .	6.0 ,	2.7		
14	(a)	0.97,	0.73,	0.48,	0.24	162.0	65.1
	(b)	48.0 ,	20.7 ,	8.7 ,	3.3		
15	(a)	0.92,	0.70,	0.46,	0.23	16.8	13.0
	(b)	7.5 ,	4.8 ,	3.0 ,	1.8		

									Absolute viscosity Schridowitz's method.	Absolute viscosity Fol's method.
16	(a)	0.71	0.53	0.35	0.18				102.8	76.0
	(b)	18.6	15.0	6.3	3.0					
17	(a)	1.00	0.75	0.50	0.25				152.0	63.6
	(b)	48 0	21.0	9.3	3.6					
18	(a)	1.00	0.75	0.50	0.25				85.0	49.0
	(b)	32.7	16.8	7.8	4.2					
19	(a)	1.00	0.75	0.50	0.25				134.0	66.4
	(b)	45.9	22.8	9.6	3 6					
20	(a)	0.96	0.72	0.48	0.24				80.2	53.7
	(b)	32.4	16.8	8.4	3.0					
21	(a)	0.95	0.71	0.48	0.24				90.2	57.1
	(b)	34.2	17.7	8.1	3.3					
22	(a)	1.00	0.75	0.50	0.25				80.2	52.9
	(b)	34.8	18.3	8.1	3.2					
23	(a)	1.00	0.75	0.50	0.25				286.0	83.6
	(b)	63.6	28.5	11.4	3.9					
24	(a)	1.00	0.75	0.50	0.25				94.0	59.8
	(b)	39.6	21.0	9.0	3.3					
25	(a)	0.92	0.70	0.46	0.23				94.0	53.6
	(b)	30.3	15.6	7 8	3.0					
26	(a)	1.50	1.12	0.90	0.75	0.37			92.0	78.3
	(b)	219.6	84.9	39 9	27.3	7.2				
27	(a)	1.45	1 22	1.09	0.87	0.77	0.36		138.0	60.5
	(b)	170.4	85.8	62.7	30.9	21.3	5.7			
28	(a)	1.29	1.16	1.09	0.97	0.77	0.65	0.32	328.0	123.9
	(b)	202.5	115.2	97.8	76.8	37.2	21.6	6.0		
29	(a)	1.09	0.98	0.87	0.82	0.55	0.27		228.0	96.6
	(b)	95.7	65.0	47.4	39.3	15.9	4.8			
30	(a)	1.26	1.13	1.01	0.88	0.75	0.64	0.38	260.0	109.3
	(b)	194.1	131.1	89.7	58.5	36.6	21.9	9.6		
31	(a)	1.15	1.03	0.92	0.69	0.46	0.23		254.0	106.1
	(b)	154.8	100.8	63.9	27.3	11.4	4.5			
32	(a)	0.99	0.89	0.79	0.69	0.49	0.30		238.0	109.3
	(b)	91.5	63.0	40.8	28.7	15.6	5.7			
33	(a)	1.00	0.80	0.60	0.40	0.20			6.5	8.2
	(b)	4.8	3 6	2.7	2.1	1.5				
34	(a)	1.52	1.37	1.22	0.91	0.61	0.30		173.0	71.4
	(b)	186.0	133.8	88.2	42.0	15.3	5.1			
35	(a)	1.70	1.36	1.02	0 85	0.68	0.51		190.0	105.8
	(b)	699.0	279.6	84.3	54.9	28.2	10.5			
36	(a)	1.44	1.15	0.86	0.58				27.0	24.4
	(b)	30.3	18.6	11.1	6.0					
37	(a)	1.49	1.19	0.89	0.60	0.30			58.0	38.3
	(b)	70.2	36.3	18.9	9.0	3.6				
38	(a)	1.45	1.30	1.16	0.87	0.58	0 29		27.0	46.3
	(b)	87.3	62.1	44.1	21.9	9.9	3.9			

No.								Absolute viscosity Schridowitz's method.	Absolute viscosity Fol's method.
39	(a)	3.61,	1.52,	1.41,	1.13,	0.85		3.9	6.4
	(b)	27.9 ,	6.9 ,	5.7 ,	4.2 ,	3.3			
40	(a)	1.5 ,	1.35,	1.20,	0.90,	0.75,	0.60	286 0	96.0
	(b)	362.7 ,	234.9 ,	150.9 ,	55.2 ,	27.6 ,	18 3		
41	(a)	2.2 ,	1.76,	1.32				3.2	3.8
	(b)	9.9 ,	6.9 ,	4.8					
42	(a)	0.85,	0.76,	0.68,	0.34			37.6	40.8
	(b)	17.7 ,	16.8 ,	17.9 ,	4.8				
43	(a)	1.42,	1.14,	0.85,	0.57,	0.28		79.6	43.7
	(b)	66.9 ,	42.3 ,	19.5 ,	9.3 ,	3.9			
44	(a)	1.47,	1.18,	0.88,	0.59			3.5	6.2
	(b)	5.4 ,	4.2 ,	3.0 ,	2.4				
45	(a)	1.43,	1.29,	1.14,	0.86,	0.57		116.0	56.6
	(b)	120.6 ,	76.5 ,	58.0 ,	25.5 ,	11.7			
46	(a)	1.46,	1.17,	0.89				3.0	5.7
	(b)	4.5 ,	3 6 ,	2.7					
47	(a)	1.47,	1.32,	1.18,	0.88,	0.59		254.0	64.4
	(b)	160.8 ,	105.6 ,	72.9 ,	31.5 ,	12 9			
48	(a)	1.45,	1.30,	1.16,	0.87,	0.58		254 0	69 0
	(b)	157.8 ,	106.8 ,	73.5 ,	32.4 ,	12.9			
49	(a)	1.41,	1.27,	1.13,	0.85,	0.56		173.0	65.4
	(b)	131.7 ,	95.1 ,	64.5 ,	29.7 ,	12.3			

Note :—a = Percentage concentration of solution.
b = Relative viscosity.
Benzene = 1.

Order of Merit.	Schridowitz's Method. No. of sample.	Fol's Method. No. of sample.
1	28	28
2	23	10
3	40	30
4	30	32
5	31	3
6	47	35
7	48	29
8	32	40
9	29	16
10	35	14
11	34	23
12	49	26
13	1	31
14	14	1
15	17	48
16	10	19
17	27	49

Order of Merit.	Schridowitz's Method. No. of sample.	Fol's Method. No. of sample.
18	19	47
19	8	17
20	45	27
21	5	24
22	16	5
23	24	3
24	25	21
25	7	45
26	3	7
27	26	4
28	21	20
29	6	25
30	18	2
31	2	22
32	20	8
33	22	6
34	4	18
35	43	9
36	9	12
37	12	38
38	13	43
39	37	42
40	42	13
41	36	37
42	38	36
43	11	11
44	15	15
45	33	33
46	39	39
47	44	44
48	41	46
49	46	41

From the history of the samples and the nature of the curves, my opinion is that Fol's method of calculation gives more reliable results, and more in accordance with facts.

FUNGICIDES; THEIR PREPARATION AND APPLICATION.

(Continued)

A. Sharples.

Fungicides containing Sulphur as a basis upon which the Fungicidal quality depends :

Since the period when Agriculturists and Horticulturists commenced using chemical solutions against the ravages of Fungi, solutions containing Sulphur in some form have always been recognised as of value. In fact, during the last decade, the advances made have not been in the direction of discovering better spraying solutions, but rather along the line of correcting the proportions of the materials used, and also in the application of the mixture. The early investigators upon this subject fully recognised the value of the principal ingredients of our up-to-date spraying solutions, and if the early literature of the subject is looked up, one finds, Copper, Sulphur, and Lime, the stock ingredients, of our spraying solutions at the present time, much in evidence as component parts of their mixtures. Bordeaux mixture, as such, has long been known. The increased value of this mixture as a fungicide has resulted through improvements in the spraying machine.

In many cases, it is dangerous to use Bordeaux mixture, due to the fact that the application of this mixture results in injury to the foliage. In these cases, a combination of Lime and Sulphur, known as the Lime-Sulphur mixture, often proves of value. In the case of many diseases, caused by fungi commonly known as "Mildews," as in the case of the Hop Mildew, the application of the Lime Sulphur wash is of special value.

Sulphur is usually applied either in powdered form, such as "Flowers of Sulphur," or as soluble Sulphur in the form of "Livers of Sulphur" or Lime Sulphur Wash.

For present purposes, nothing more than mere mention of the first two is necessary.

Flowers of Sulphur.

"Flowers of Sulphur" is often valuable to the Horticulturist as a specific against Plant Disease. The application is usually made by dusting the powder over the leaves as equally as possible when the dew is upon them, or after being moistened artificially. Under the heat of the sun, SO_2 is generated, and to this compound is due the Fungicidal quality, Hot summery weather is necessary for the successful working of this compound.

Livers of Sulphur.

"Livers of Sulphur" usually consists of a mixture of Polysulphides of Potassium and Sodium. In applying the substance to diseased plants, 1 oz. is usually dissolved in 2 to 3 gallons of water. This solution will not keep.

Lime-Sulphur Spray.

This mixture will probably prove of value in combating "Pink Disease." Bordeaux mixture cannot be used in this connection, unless applied very carefully as a "paint." The Lime-Sulphur" spray can be used either as a "spray" or a "paint," and in any case, it is much the safer mixture to use amongst Rubber. Many enquiries for the method of preparation reach the Department, and so the preparation of this mixture will be fully considered. The information as regards preparation is derived from a leaflet issued by the South Eastern Agricultural College, entitled "Lime Sulphur Wash" by E. S. Salmon.

The wash is prepared by boiling Lime and Sulphur with Water. Chemical reaction takes place, bringing about the solution of the Lime and Sulphur.

Recent chemical investigations have shown the following formula to be the best.

Quicklime (in lumps) ...	... 48	lbs.
Flowers of Sulphur ...	... 96	,,
Water	... 50	galls.

Good fresh Quicklime must be used, as otherwise the concentrate will not be of the desired density. Some form of heating apparatus is necessary, either made of iron or zinc: *Copper ones cannot be used.*

Preparation.

The wash is prepared as follows:—

10 galls. of water are poured in the heating apparatus, and the fire started. Then the 48 lbs. of Quicklime is added. When the slaking is well started, add the 96 lbs. of Sulphur gradually, and mix until a thin even paste is formed, taking care to break up all the small lumps of Sulphur as far as possible. If too thick a little more water may be added. When thoroughly mixed add water to make up to 50 galls., *boil vigourously for one hour*, stirring frequently and adding water when necessary to keep it at the same level.

The wash thus prepared (on settling) will be a clear orange red liquid, most of the Lime and Sulphur becoming dissolved during the boiling. A small amount of Lime and Sulphur remaining undissolved.

The wash is most conveniently prepared in concentrated form, later, on using, to be diluted with water to the required strength.

The most convenient method of preparation for planters inclined to use this wash, will be to utilise a kerosene tin, in which to boil the mixture. Sufficient concentrated wash could thus be obtained, using a 4 gall. kerosene tin, for any planter to test the

efficiency of the wash. The approximate proportions of materials, under these conditions would be :—

Quicklime (in lumps) ...	...	4 lbs.
Flowers of Sulphur ...	...	7½ ,,
Water	...	4 galls.

1 gall. of water should be placed in the tin, and the fire started. Then add the 4 lbs. of Quicklime. Later, following the instructions given above, the Sulphur is added, and finally the water.

The resulting liquid must be strained, and stored immediately where air cannot reach the liquid. If kept in air-tight receptacles this concentrated wash will keep until wanted for use.

The concentrated wash requires to be diluted before it can be used upon foliage. For this reason, the Specific Gravity of the liquid should be determined by means of a hydrometer. The Sp. Gr. of the concentrate will vary considerably, due chiefly to differences in the Lime used, and also to details connected with boiling. A good Lime Sulphur Wash will have a Sp. Gr. of about 1.20.

For use on foliage water should be added until it has a Sp. Gr. of 1.01, when the wash may be termed full strength, or further diluted until it has a Sp. Gr. of 1.005 for the half strength wash. One gallon of the concentrated of 1.20 Sp. Gr. will make 20 galls. of full strength wash, (1.01 Sp. Gr.), or twice the amount of half strength (1.005 Sp. Gr.).

So that if 4 galls. of the concentrated wash is made up in a kerosene tin, and the given instructions followed, this amount ought to give 80 galls. "full strength" wash. This "full strength" wash will be of most service against "Pink Disease."

Firms of repute are now placing upon the market a factory boiled concentrated Lime Sulphur wash of Sp. Gr. 1.300. One gallon of such a wash will make 30 galls. "full strength" wash.

Recent investigations in the U. S. of America indicate that the fungicidal qualities of the Lime Sulphur Wash are considerably increased if Arsenate of Lead is added. This compound is placed on the market as Swift's "Arsenate of Lead" paste, and should be added to the Lime Sulphur Wash at the rate of 2 lbs. to 50 galls. Also, what is of importance, the value of the "Arsenate of Lead" as an insecticide is not interfered with.

Application.

The "full strength" wash may either be sprayed or painted on the infected branches. In connection with spraying, copper spraying machines must not be used as the liquid reacts chemically with the metal. A fine nozzle must be used. Painting the infected patches, on trees attacked by *Corticium Javanicum* with the concentrated wash will probably prove of value.

GUTTA PERCHA FROM PALAQUIUM OBLONGIFOLIUM.

Gutta Percha is derived principally from trees growing within a few degrees of the equator and is an important product in the Fed. Malay States. The gutta percha of commerce may be obtained from the latex which exudes from the trees by cutting or tapping as in the case of Hevea latex, etc., and subsequent coagulation.

Gutta Percha is usually understood to refer to the coagulated latex from the Genus Palaquium (also known as Dichopsis.)

The best gutta percha in this country is derived from *Palaquium oblongifolium*, known by the Malays as Taban Merah.

The Conservator of Forests has stated that this tree (*Palaquium oblongifolium*), is found in all four States, although many of the older trees in the virgin jungle have been destroyed by felling by natives, in order to obtain the latex. It occurs principally on the low lying hills and plains but is often found at elevations of 2000-3000 feet about sea level and may occur regularly distributed in afew hundred acres of forest, or in large areas of 10,000-15,000 acres. The Conservator of Forests in the Agricultural Bulletin S.S. and F.M.S. for 1905 states that the trees grow to a large size and he has measured a fallen tree 52 feet high and 42 inches girth at 14 feet from the base.

Attempts have been made within recent years to establish nurseries or to plant up through rentices in the jungle.

Methods of production :—The natives usually fell the trees and extract the latex by very crude and wasteful methods, and regulations for the protection of the trees have been made from time to time, since the formation of a Forest Department. Among these measures were a high (80 per cent.) ad valorem duty, the prohibition of felling, and the withdrawal of licences. To encourage the growth of the young trees, which is rather slow, the surrounding jungle is cleared from time to time and young plants from fallen seeds, transplanted in certain places.

Methods of extraction of latex :—The latex from the trees exudes immediately on tapping or cutting the bark and resembles Hevea latex in general appearance. It coagulates quickly and becomes reddish pink—probably due to an oxidising enzyme in the latex—on standing.

The natives, as stated above, formerly felled the trees and cut circular incisions at short distances apart, round the trunk, from which the exuded latex—which had coagulated naturally, was removed.

The crude product obtained in this way naturally contains bark, dirt, etc., and was sometimes washed and pressed into blocks.

A tree about 50 years old, measuring 3 inches in girth at 4 feet from the base with a height of 55 feet and branching at 35 feet,

when treated in this way, under supervision, yielded only 1½ lbs. of gutta percha.

Various other methods such as extraction from the leaves, twigs and bark—have been tried, especially in Java. The green leaves are stated to contain 3 per cent. and the bark 5 per cent. of gutta percha.

Properties and uses :—The chief property of gutta percha—as compared with raw rubber is its plasticity and capacity for being moulded into any shape especially when softened by heating.

Its principal use is as an insulating material for submarine cables, as it is unaffected by the conditions prevailing.

It is also stated to be preferable for this purpose to rubber, as it is often less porous on vulcanisation. It was probably formerly used to a greater extent for land cables, where cheaper materials, such as papier machè, etc., have been substituted.

Commercial gutta percha contains principally "Gutta" resembling "Caoutchouc" chemically but not physically., and resins known as "Albanes" with other impurities, water. etc.

Report on a sample of gutta percha :—

The following report from Prof. Wyndham Dunstan C.M.G. Director of the Imperial Institute is based on an examination of the product obtained by tapping the standing trees of the *Palaquium oblongifolium* sent to the Imperial Institute by the Conservator of Forests S.S. and F.M.S.

Description of sample :—The sample consisted of blocks of gutta percha, of a pinkish grey colour on the exterior and paler within. The material was clean and well-prepared and possessed satisfactory physical qualities.

Results of chemical examination :—

The chemical examination yielded the following results :—

	per cent.
Loss on Washing (moisture and impurities.)	20.9
Composition of dry washed gutta percha.	
Gutta	85·7
Resins	13·1
Protein	0·7
Ash	0·5

The above analysis shows that the gutta percha is of very good quality chemically, the loss on washing however being rather high, chiefly on account of the presence of much water.

The solid impurities ("dirt") are however very low, being only 3.3 per cent. in the dry material.

Tensile strength :—The tensile strength of the sample was ascertained by a manufacturing firm with the following results :—

Tensile strength	...	2,607 lbs. per sq. inch.
Elongation	...	415 per cent.

These figures were stated to be not quite so good as the best gutta percha obtained in the ordinary way, but all the other properties of the material compared favourably with those of the best gutta percha.

Valuation :--The sample was valued at 6/- (six shillings) per lb. by one firm (February 1913) and 7/6 (seven shillings and six pence) by another firm (April 1913). It was also valued at 3/- to 4/- (three to four shillings) per lb. by brokers (January 1913), who stated that it was difficult to give a valuation in the absence of technical trials.

One firm stated that they doubted whether the amount of "dirt" could be kept so low when preparing large samples.

Conclusions :—The Director states that, as a result of these examinations, it is evident that the gutta percha obtained by tapping standing trees is of good quality and could command satisfactory prices in the market.

B. J. E.

RUBBER MANURIAL EXPERIMENTS (JAVA.)

In a bulletin* recently issued from the agricultural chemical laboratory of the Department van Landbouw, Java, over the name of Dr. A. W. K. de Jong, appear the results of some experiments on the influence of manuring on the girth increase of Hevea trees, an account of which may be of interest.

The number of trees employed was 336, of which 252 had not previously been tapped. All were very backward in growth owing to the fact that no weeding system had been adopted.

The whole plantation was intersected by trenches 1½ feet deep and 1 foot broad so that each tree stood as it were on a square island.

The planting distances differed considerably. Trees 1-71 were planted 18 × 18 ft.; 72-175, 16 × 16; 176-230, 28 × 28: and the remainder 12 × 24.

A series of seven manurial tests was carried out, one plot remaining untreated. To equalise the differences due to planting, etc., the trees were divided up into groups of 4, each experiment thus being carried out on 10½ of these groups. The initial girths were measured at a height of 1 metre (39.4 inches) from the ground, and the combined girths of the 42 trees in the various plots at the beginning of the trial (April 3rd 1911) were as follows :—

*Mededeelingen van het Agricultuur Chemisch Laboratorium No. IV. evea brasiliensis, Wetenschappelijke proeven, door Dr. A. W. K. de Jong.

I	II	III	IV	V	VI	VII	VIII	
1336·5	1302	1383	1430	1406	1426	1394·5	1368	centimetres
516	512	544½	563	553½	561	549	538½	inches.

The age of the trees was 6 years, *i. e.*, 5 years 4 months from the planting out of the stumps.

The following fertilisers were applied in a circle of radius 1 metre from the tree.

I Double superphosphate 30 grams per tree.
II ,, ,, ,, + chloride of potash 10 grams.
III ,, ,, ,, + sulphate of ammonia 10 grams
IV The same + both chloride of potash (10 grams) and sulphate of ammonia (10 grams.)
V Chloride of potash 10 grams.
VI ,, ,, ,, + sulphate of ammonia 10 grams.
VII Sulphate of ammonia 10 grams.

This application was made on 12 April and a second similar one on July 19. The trees were measured again on 20 November. and shewed the following increases :—

I	II	III	IV	V	VI	VII	VIII	
146·5	144·5	146·5	157·5	152	154	153	140·5	cms.
57·7	56·9	57·7	62·0	59.8	60.6	60·2	55·3.	inches,

On Nov. 24 a fresh application of double the above quantities of the fertilisers was made and again on 25 January, 1912. On 8 April, 1912, fresh measurements were taken when the following increases over the original were found :—

I	II	III	IV	V	VI	VII	VIII	
295	287	291·5	319	293·5	304·5	318·5	280	cms.

Following this were made further applications on 1 May and 2 August of similar mixtures in which the amounts of double superphosphate, chloride of potash, and sulphate of ammonia were 50, 50, and 100 grams respectively.

The final girths recorded were taken on 17 November, 1912, and were as follows (increases over original) :—

I	II	III	IV	V	VI	VII	VIII
392	377·5	394	421	394·5	417·5	415	368

The net increases over the control plot were therefore

		Cms.		Inches.
I	Phosphate	24	=	9·4
II	Phosphate + Potash	9·5	=	3·7
III	Phosphate + Nitrogen	26	=	10·2
IV	Phosphate + Potash + Nitrogen	53	=	20·9
V	Potash	26·5	=	10·4
VI	Potash + Nitrogen	49·5	=	19·5
VII	Nitrogen	47	=	18.5

De Jong proceeds to point out that although the increase obtained from using nitrogen alone is hardly less than that derived from the complete fertiliser (IV) yet, as certain amounts both of potash and of phosphate are removed from the tree in the latex, it is still possible, that applications of these last mentioned substances may prove profitable and he hopes subsequently to decide this point.

In addition to the author's own criticism that the number of trees employed was too small for the results to be completely satisfactory the following remarks may be added :—

No information is given relating to the composition of the soil in which the trees were growing, but if, as the reviewer believes, the experiments were carried out at Buitenzorg, it is considerably poorer in nitrogen, through being for centuries under cultivation, than that on which are situated most of the Malayan estates, but on the other hand is richer in phosphate.

The extreme smallness of the size of the trees (averaging at 6 years only 12·9 inches in girth 3ft. 3in. from the ground) is testimony to the poverty of the soil and to the influence of the weeds in which, it is stated, the trees were growing.

It would have been better had the plots been limed before manuring, as, apart from the possible need of lime in the soil, this measure has been proved by Pickering in the Woburn experiments to be efficacious in destroying the toxins invariably secreted by weeds, de and grass. As it is, it is not unlikely that the actual effect of the various manures on the trees in these experiments is partially obscured by their action on the toxins.

The quantities of fertiliser applied, amounting in all to only 1·8 oz. nitrogen, 2½ oz. potash (K_2O) and 1·8 oz. phosphoric acid (P_2O_5) per tree seem too small, considering the age of the trees, to afford very definite results and are in fact less than would be used in actual practice.

It will be noted that the maximum increase in girth obtained, that brought about by the complete fertiliser, averages barely ½ inch per tree.

Also, as a minor point it may be suggested that it would have been preferable to have made the plot having the *highest* initial girth the control, and to have applied the complete fertiliser, from which the greatest increase was to be expected to that in which the average girth was originally the lowest, in order to anticipate the possible objection that the same influences which had caused these differences might still be in operation.

In other respects however the experiments were well arranged.

M. B.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA, HELD AT JOHORE HOTEL, JOHORE BAHRU, ON JULY 13th, 1913, AT 10.30 a.m.

Present.

R. W. Munro — Chairman.
G. H. Day — Legal Adviser.
H. C. E. Zacharias — Secretary,

and the following Delegates from the various constituent Associations:—

H. E. Darby.	Batang Padang Planters' Association.
Neill Mackinnon.	Johore Planters' Association.
E. D. Bryce.	do. do.
A. L. Buyers.	do. do.
A. Voeterdal.	do. do.
J. Bruce.	do. do.
E. Macfadyen.	Kuala Langat District Planters' Association.
G. C. Ash.	do. do.
E. B. Skinner	Kuala Lumpur District Planters' Association.
F. Zernichow.	Lower Perak Planters' Association.
J. W. Campbell.	Malacca Planters' Association.
C. Ritchie.	Negri Sembilan Planters' Association.
W. D. Davidson.	do. do.
A. S. Crisp.	do. do.
F. J. Lloyd.	Negri Sembilan Planters' Association.
P. W. N. Farquharson.	do. do.
E. A. Tayler.	do. do.
W. E. Stephens.	Singapore Planting Association.
E. Granville Smith.	Ulu Selangor District Planters' Association.

Hon. Members :—

L. Lewton-Brain.	Director of Agriculture.
C. Lane Sansom.	Principal Medical Officer.
E. S. Hose.	Ag. Controller of Labour.

Visitors :—

E. Gordon, A. S. Chilvers, M. MacKenzie.

LONDON, 1914, EXHIBITION.

A letter from the Under Secretary, Federated Malay States, was read promising the co-operation of the Federated Malay States Government with regard to this Exhibition provided the planting community undertook to raise £1,000 towards the expenses.

A letter from Mr. C. Baxendale urging participation was also read.

A draft circular was approved in which estates were asked to contribute at the rate of eight cents per acre of cultivated land.

Batavia Exhibition.

It was decided to join with the Federated Malay States Government in sending a commission to the Batavia Exhibition and Congress.

Repression of Drunkenness.

The Honourable Mr. Skinner stated that he had recommended to Government the appointment of a technical Committee to consider the question of the alcoholic strength of toddy and the harm this drink was causing. He moved that Government should be asked to make it an offence not only to *sell* but to *give* spirits to Indian labourers and also for Indian labourers to be in possession of them.

Mr. Macfadyen seconded and the motion was carried unanimously. The Secretary is directed to address the Colonial, Federal and Johore Governments accordingly.

Honorary Members.

Mr. Munro on behalf of the Standing Committee proposes the following addition to the Rules:—

" All members, who shall have served the office of Chairman of " the Association for at least one year shall become Honorary " Members of the Association."

This is seconded by Mr. Campbell and carried unanimously. Mr. Munro gives notice that he will propose at the next meeting the election of the Director of Gardens, Straits Settlements, as a Honorary Member.

Education on Estates.

The Secretary reports in the replies he has received from the various District Planters' Associations with regard to the number of estates that are providing or are making provision to provide Education for Tamil children.

The Chairman reads a letter he had addressed to the Under Secretary with regard to the hours during which it was suggested the Estate schools should be open.

After some discussion it was decided to leave the matter with the Standing Committee.

Labour Code.

Mr. Macfadyen on behalf of the Standing Committee submits a report on debated points connected with the Labour Code of 1912 and it appears that a settlement, which on the whole the Planters' Association of Malaya might regard as a favourable one, was in sight.

The Chairman thanks the Standing Committee for their work in this connection.

He also propose a vote of thanks to the Rubber Growers' Association for their assistance.

Both votes are carried with acclamation.

Extradition of Absconders.

Mr. Campbell raises the question of the extradition of absconding coolies from Johore to Malacca and points out that there is no law preventing coolies walking across the border and taking service on the other side.

It was unanimously agreed that representations be made to the Colonial, Federal and Johore Governments to make absconding an extradictable offence.

Tamil Holidays.

A list of Tamil Holidays suggested by the Controller of Labour is read. The Secretary reported that he had suggested some modifications.

Date of Payment of Wages.

Correspondence with regard to this is read and the Honourable Mr. Skinner reports on his action at the Federal Council.

Mr. Macfadyen suggests that the Association promote a private bill to be brought before the Federal Council at the next session and similarly before the Legislative Council and proposes that the whole matter be referred to the Standing Committee. This is agreed to.

Standardization of Rubber.

Correspondence with regard to this is read and the Secretary reports that he has thanked the Government for the ready manner in which it had acceded to the representations made by the Association.

Licensing Rubber Dealers.

The Secretary reads a letter he has addressed to the Colonial Secretary, Straits Settlements and the Under Secretary, Federated Malay States, pointing out that few benefits have been derived from the law owing to the fact that no special machinery has been provided to administer it.

Machinery Enactment.

The Honourable Mr. G. H. Day outlines the principal amendments which had been secured in the Machinery Enactment. The original draft said that after a serious accident all machinery had to

stand still until an inspector had seen it. That had been amended to provide that no alterations or additions should be made to the machinery. They had also secured an appeal to the Resident from a decision of the Chief Inspector.

Malay Reservation Enactment.

The Honourable Mr. Skinner reports that in view of the strong opinion held by the Sultans, the unofficial members had decided not to oppose the measure.

Agricultural Pests Enactment.

The Honourable Mr. Skinner summarises the action taken by the Federal Government. The Director of Agriculture states that to carry out the Enactment, a Chief Inspector and three assistant Inspectors had already been appointed, while the appointment of the fourth Assistant Inspector provided for had not yet been made.

As to the question of locusts the Government Entomologist, though he was too busy to report fully, had devised measures which under certain circumstances, at any rate, were successful in dealing with this pest. He believed that the Government would be willing to take the matter in hand thoroughly, once practical methods for destruction had been devised.

Mr Campbell hopes that the Colony would introduce similar legislation to the Agricultural Pests Enactment.

The Chairman congratulates the Director of Agriculture on the progress made and thanks the unofficial members for their good offices in connection with the Machinery and Pests Enactments.

Freight on Rubber.

Correspondence referring to this is read and the meeting decides to approach the Rubber Growers' Association with a view to taking up the matter with the shipping Conference.

Agricultural Bulletin.

The question of the arrangement between the Department of Agriculture and the Planters' Association of Malaya with regard to the *Agricultural Bulletin* is brought up for discussion.

The Chairman eulogises the excellent work done. The Bulletin filled a real want and, as it was supplied free to every member of all Constituent Associations, had become a powerful link, binding the Parent and Daughter bodies together.

He had much pleasure in proposing the renewal of the present working arrangement for another year.

Mr. Bryce seconds the motion and only regrets that more planters did not contribute to the Bulletin. Surely the old idea of secrecy and every man for himself was exploded. What they all wanted, was to work together and compete, not against each other, but against the wild forms of rubber.

The proposal was carried unanimously.

Lower Perak.

Mr. Zernichow describes the deplorable state of the Water Supply, Roads and Drainage in the Telok Anson District. Matters had grown simply intolerable, and none of their many complaints and representations to Government had ever improved matters. He had been delegated by his Association to ask the Planters' Association of Malaya for their assistance and he now begged to propose that the Standing Committee visit the District and enquire into the whole matter.

Mr. Macfadyen seconds the proposal, which is carried unanimously.

With a vote of thanks to the Chair, the meeting terminates at 1.30 p. m.

Sgd. H. C. E. Zacharias.

Secretary.

BAGAN DATOH PLANTERS' ASSOCIATION.

A meeting of the above association was held at the resthouse on June 25th, preceded by a committee meeting.

Present, Messrs. T. T. Beaty Pownall, (chairman) Gillespie, Phillips, Counsel, Manchip, Lawford, Davidson, Alexander, Pratt, Carter, and visitor, Mr. A. W. Wilson.

The minutes of the last meeting were read and passed. The circular letter from the Planters' Association of Malaya, re. "Education on Estates," was read, and the chairman spoke to the effect that it would be as well to get figures from members at once.

It was resolved that the secretary write to individual members for the figures required by the parent Association.

Mr. Lawford, in a short speech, urged the great importance of the damage by rats in the District which Mr. Counsel heartily endorsed. Mr. Lawford proposed, and Mr. Counsel seconded "That the Agricultural Department be approached in person, in regard to the pests of rats and caterpillars." On Mr. Pownall's suggestion, a deputation, consisting of the chairman and Messrs. Counsel, Davidson and Lawford, was appointed, to interview the Director of Agriculture on the subject at the earliest possible date. Carried.

A notice from P. A. M. re. Recruiting was read and Mr. Gillespie said he would like to see uniformity in the district both in regard to pay and recruiting allowances. He suggested, that for the first 6 months, a man should be rated at 40 cents, and a woman 25 cts., to be raised to 45 cts. and 30 cts. respectively. Messrs. Phillips and Counsel spoke in support. Mr. Counsel further suggested, that in view of the size of the district, it would be advisable to approach the Lower Perak P. A. with a view to combined action being taken. After further discussion Mr. Counsel proposed that the matter be referred to the committee to draw up regulations, (to which the members of this association agreed to adhere), and to arrange a meeting with the Lower Perak Association at the earliest date possible. It was proposed that Messrs. Counsel and Davidson be asked to serve on the committee in this matter. Seconded by Mr. Gillespie, and carried unanimously.

A letter was read from the Lower Perak P. A. announcing a meeting on July 5th, to consider the best means of communication between Teluk Anson and Sitiawan. The chairman proposed that the secretary write accepting the invitation, and urged members to turn up in force.

Mr. Counsel then addressed the meeting on the subject of the "State of the Roads and Drains in the District," and suggested that a member of the Federal Council be approached with a view to his visiting the district, and seeing the state of affairs for himself.

The chairman proposed, as an alternative, that the planting member be asked to come down. Mr. Lawford suggested that Mr. Munro as chairman of the P. A. M. be written to, with a view to obtaining a visit from a planting member of the Federal Council at an early date. This was seconded by Mr. Phillips, and carried unanimously.

Mr. Counsel proposed, and Mr. Phillips seconded, "That the minutes of meetings be sent to the papers."

Mr. Lawford proposed, and Mr. Counsel seconded, "That the minutes be sent to the *Agricultural Bulletin, F.M.S.* Carried.

Mr. Counsel proposed, "That the secretary write to the District Officer, Lower Perak, strongly urging that a magistrate be sent to Bagan Datoh, to sit at least once a week for the purpose of dealing with labour cases."

Mr. Davidson pointed out the hardship and loss of time entailed under existing conditions owing to the necessity of going to Teluk Anson, 25 miles away, to prosecute absconding and other coolies. Mr. Lawford spoke to the same effect, and seconded the motion, which was carried.

Mr. Lawford proposed "That the Secretary write to the State Engineer, asking for an up-to-date plan of all drainage works, com-

pleted, or in course of construction, in the district." This was seconded by Mr. Davidson, and carried.

The meeting terminated with a vote of thanks to the chair.

F. T. MILLARD.

BURR FORMATION.

In the preliminary note on this subject in last month's Agricultural Bulletin it was suggested that burrs on rubber trees originate as the result of irritation set up by some substance present in the cells of the cortex. It has since been discovered that this substance is the coagulated latex in old laticiferous vessels. This gives rise to burrs in both untapped and renewing bark.

A full account will be published in due course.

E. BATESON.

SOIL ANALYSES.

Managers desiring analyses made of soils of their estates for the purpose of arranging manurial trials, etc., are requested not to take the samples themselves but to communicate with the Director of Agriculture, who will arrange that the officer in charge of soil work shall visit the estate, take the samples and make the necessary notes on conditions, etc., himself.

DEPARTMENTAL NOTES.

Mr. P. B. Richards, Assistant Agricultural Inspector, Department of Agriculture, F.M.S., arrived at Kuala Lumpur and assumed his duties on 30th June (A. B. Vol. I. No. 11, p.413).

NOTICE.

An Index to the First Volume of the *Agricultural Bulletin, F.M.S.*, is in course of preparation and will be issued shortly to all subscribers.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Places of Destination.	Exported during June, 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Value of rubber, 1913, to date.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	$	$
Straits Settlements ...	1,212.08	3,472.67	4,684.75	2,713.61	1,971.14	14,524,459	361,347.54
United Kingdom ...	674.03	4,221.78	4,895.81	3,485.23	1,410.58	15,562,153	389,053.82
Continent of Europe ...	81.88	527.75	609 63	467.85	141.78	1,960,424	49,010.60
Ceylon	37.96	255.21	293.17	200 39	92.78	946,314	23,657.85
Other Countries ...	...	...	...	...	...	...	...
Total ...	2,005.95	8,477.41	10,483 36	6,867.08	3,616,28	32,993.350	823,069.81

KUALA LUMPUR,
5th July, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of June, 1913.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Khota Bahru	...	147.	...	91.23	74.43	16.80	...	.968	78.3	.83	...	6.68	1.72
Malacca, Durian Daun Hos.	29.850	133.6	81.9	87.5	72.8	14.7	79.2	.962	...	.88	N. W.	8.94	2.55
N. Sembilan, Dist. Hospital Seremban	...	147.6	79.9	87.3	71.6	15.7	76.1	.823	74.6	.81	S. W.	8.47	1.31
,, Dist. Hos. K. Pilah	...	148.2	80.8	89.3	74.5	14.8	76.7	.842	74.	.80	...	5.92	1.05
,, ,, Tampin	...	154.1	80.2	88.2	74.2	14.	76.1	.822	73.2	.79	...	5.02	1.15
,, ,, P. Dickson	...	152.2	82.0	87.9	74.6	13.3	77.7	.866	74.8	.79	...	13.98	1.87
Pahang, ,, K. Lipis	...	...	81.4	89.6	69.2	20.4	75.5	...	...	...	...	6.67	2.59
Penang, ,, Penang	29.777	143.	83.1	89.7	74.4	15.3	77.6	.881	74.6	.78	...	10.47	3.25
Perak, ,, Taiping	...	108.	82.91	94.	70.	24.	78.09	.896	...	.81	...	11.85	3.67
,, ,, Ipoh	...	...	82.	92.	71.	21.	77.12	.868	...	.81	...	15.33	4.28
,, ,, T. Anson	...	...	82.65	92.	69.	23.	79.53	.966	...	.87	...	5.62	1.90
,, ,, P. Buntar	...	...	82.18	92.	71.	21.	77.69	.889	...	.83	...	7.84	2.50
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	18.46	4.55
Selangor, General Hospital Kuala Lumpur	...	146.	80.9	88.9	72.5	16.4	77.6	.879	75.3	.82	...	3.77	1.22
,, Dist. Hos. Klang	...	...	...	88.2	73.5	14.7	...	...	...	...	...	5.96	2.00
,, ,, K. Selangor	...	...	...	88.2	70.3	17.9	...	...	...	...	...	6.35	2.40
,, ,, Rawang	...	...	...	91.3	72.7	18.6	...	...	...	...	...	6.24	1.88
Singapore, Kandang Kerbau Observatory	29.896	155.	82.2	91.4	72.	19.4	76.2	.896	...	.82	S. E.	12.81	3.65

THE

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ESTATE TAMIL LABOUR STATISTICS (F.M.S.) IN 1912.

By E. Macfadyen.

The following table is compiled from the figures relating to Estate Tamil labour forces in the F. M. S. which accompany the Controller of Labour's Annual Report for 1912 :—

	Selangor	Perak	Negri Sembilan	Pahang	F.M.S.
Recruited during 1912 ...	38,868	18,358	7,833	414	65,473
Engaged locally ...	12,350	19,663	2,748	343	35,104
Employed on Jan. 1st 1912 ...	59,185	38,903	11,718	636	110,442
	110,404	76,924	22,299	1,393	211,019
Died during the year ...	2 214	1,411	1,333	47	5,005
Deserted ,, ...	14,915	11,719	3,633	349	30,616
Discharged ,, ..	24,949	20,517	5,449	354	51,269
	42,078	33,647	10,415	750	86,890
Balance on 31st Dec., 1912 ...	68,325	43,277	11,884	643	124,129
Average estate population ...	59,396	41,090	11 688	600	112,774
Death rate ...	3.72%	3.43%	11.40%	7.83%	4.43%

The total Tamil population of the F. M. S. at December 31st is estimated to be 210,000; so that working estate coolies constitute a fraction less than 60% of the whole Tamil population.

The above table indicates that taking the country as a whole planters lost from one cause or another during the year numbers equal to 78.67% of the labour forces they began the year with.

They recruited from India numbers equal to 59.29% of their initial force; and engaged locally numbers equal to 31.78%.

After deducting losses from gains the nett result was a gain on balance of 12.40%.

The above table may be rearranged as follows, in terms of percentages (to the nearest unit) on the forces employed on January 1st:

	F.M.S.	Selangor.	Perak.	N. S'lan.	Pahang.
Additions ...	91	86	97	90	119
Losses ...	79	71	86	89	118
Nett gain ...	12	15	11	1	1

The additions, expressed in the same terms, consist of:—

	F.M.S.	Selangor.	Perak.	N. S'lan.	Pahang.
Coast recruits ...	59	65	47	67	65
Local " ...	32	21	50	23	54

The losses, expressed in the same terms, consist of:—

	F.M.S.	Selangor.	Perak.	N. S'lan	Pahang.
Discharges ...	47	43	53	47	56
Desertions ...	28	25	30	31	55
Deaths ...	4	3	3	11	7

The gain by recruiting from India exceeded the mean for the four States in all except Perak: desertions exceeded the mean in all except Selangor, and were practically double the mean in the case of Pahang. Perak was the only State in which local engagements exceeded desertions.

Incidentally one may note that some error appears to have crept in to the Selangor figures as printed; since column 6 of the table in appendix F is not equal to the totals of columns 10 and 11.

THE NEW COCONUT CULTIVATION ENACTMENT IN KEDAH.

A copy of the Coconut Cultivation Enactment 1331 has recently been received from the British Adviser to the Government of Kedah. This enactment has been passed for the purpose of encouraging the cultivation of coconuts by small proprietors in

mukims that are either outside the padi planting area or are especially adapted to the cultivation of coconuts. For this purpose, according to the terms of the Enactment, any person who is cultivating, in any of the mukims enumerated in the schedule of the Enactment, land of which the area does not exceed 20 relongs ($26\frac{2}{3}$ acres) and in respect of which he has paid land-tax or land-rent for the past year, may, on planting not less than 30 coconuts obtain remission of land-tax or land-rent in respect of one relong of his land for three years. Further, he can obtain remission of land-tax for the same period on an additional half relong of land for every 15 trees planted. It should be noted that no one is allowed to take up new land under this Enactment. He must first take up the land in the usual course and plant it with coconuts and then he can apply for remission of the land-tax in accordance with the number of trees planted.

In order to obtain the remission authorised the owner of the land planted in coconuts must report to the penghulu within six months from the date of planting. The penghulu himself, or his deputy, is then required to visit the land, inspect it and count the number of trees upon it which in his opinion are not more than six months old. After this he is to issue a certificate to the owner, who has to take it to the Land Officer of the District. The latter is empowered to act on the Penghulu's certificate without further enquiry and to issue to the owner a second certificate exempting him from land tax or land rent in respect of that area of his land which contains coconut trees at the rate of 30 to the relong, no area being included in addition to the first relong that is less than $\frac{1}{2}$ relong in extent.

When the Land Officer's certificate covers all the land owned by the proprietor the latter is exempt from attendance at the Land Office until the fourth year; when only part is so covered the proprietor is required to pay land tax or land rent upon the residue not planted in coconuts or not containing them at the specified rate.

If a man plants coconuts on part of his land only in the first year and obtains remission of the land tax or land rent for that year, and then plants a further portion of his land in the second year he can obtain a second certificate from the penghulu in respect of the second portion which entitles him to remission of land tax or land rent in respect to that portion for a further period of three years.

The Director of Lands is required to send land-rangers to inspect lands for which the special privileges of this Enactment

have been granted, and the same officer must on a report from the Land Officer send land-rangers to make enquiries if a penghulu is suspected of neglecting his duties or of not acting in accordance with the provisions of the Enactment. Thus a certain amount of supervision is provided.

In order to explain further this Enactment the "Objects and Reasons" for it are here quoted:—

> "The object of this Enactment is to encourage the planting of coconuts by small proprietors in certain mukins outside the padi-planting area. It is sought to do this by remitting, wholly or partially, the land-rent or land-tax for 3 years on such holdings, not exceeding 20 relongs in area as are wholly or partially, brought under coconut cultivation. The mukims to which the Enactment applies are set forth in a schedule. All the mukims in Langkawi Island (which is particularly adapted to coconut plantation) are included, the interior mukims of Kubang Pasu, every mukim in Padang Trap, the interior mukims of Kota Star, every mukim in Baling, and a few special mukims, mostly in the interior in Kuala Muda, Kulim and Krian. With the exception of a few specially suitable mukims such as Yen, Singkir and Merbok, no mukim on the coast, which is the padi area *par excellance*, is included. It is considered desirable to make the procedure for obtaining exemption as simple as possible. Any elaborate procedure, hedged in on all sides with safe guards, will choke off any intending cultivator. And so the Government takes a certain amount of risk, and grants exemption upon a certificate by the penghulu.
>
> "Only 30 trees to the relong are required to be planted. This is a very small number and allows the trees to be planted more than 30 feet apart. But it must be remembered that there are probably other trees already growing on the land, and that there are also buildings, etc. (Trees planted 25 feet apart are 50 to the relong.) Thus it works out that as soon as a man has planted 30 young plants, he obtains a remission amounting to $1.50 (50 cents per relong per annum for 3 years) equivalent to 5 cents per plant.
>
> "This amounts to the Government providing the coconuts gratis. To grant exemption for longer than 3 years upon a penghulu's certificate would, it is thought, be asking too much. And, on the other hand, any complicated system by which the trees would be re-counted at any interval would only lead to bickerings and discontent."

INTERNATIONAL RUBBER AND ALLIED INDUSTRIES EXHIBITION LONDON, 1914.

The following competitions in connection with the above Exhibition are notified :—

The President's Trophy.

Sir Henry A. Blake, G. C. M. G., has intimated that he will present a Trophy for the exhibit proving the greatest interest in connection with the preparation, production, or use of rubber in any form.

Rubber Growers' Association Competitions.

Competition I. Medals will be given for the best commercial samples of plantation rubber exhibited in the following classes: Class 1.—Crepe. Class 2.—Smoked Sheet. Class 3.—Assorted Invoice, embracing No. 1 rubber and scrap grades. Entries close May 1, 1914.

Competition II. A gold medal will be given for the best exhibit connected with plantation rubber, grown in the Middle East. No entry will be necessary.

Competition III. A prize of £50 and a gold medal will be given to what is adjudged the most valuable improvement connected with the collection or preparation of plantation rubber (open only to Managers or Assistants on Estates), such improvement to have been introduced between July 1, 1913, and March 31, 1914, on which latter date entries close.

Competitions IV and V are for manufacturers.

Competition VI. A prize of £50 and a gold medal is offered for the discovery and application of such new use for plantation rubber as may be adjudged the most valuable.

India Rubber Journal Competitions.

Ideal Rubber Estate Factory. The proprietors of the *India Rubber Journal* offer a prize of £25 for the best plan of and essay on a rubber estate factory.

Estate Photograph Competition. A prize of £25 is also offered for the best collection of photographs illustrating all departments of rubber estate work, from seed collection to shipping of rubber. Entries close May 12, 1914.

The Rubber World Trophies.

A silver cup, value £20, will be awarded by the *Rubber World* for the Essay judged to be the most practical, useful, and comprehensive on the subject: What is an Ideal Rubber Estate? The

idea of the competition is not literary but practical and competitors must be or have been planters or assistants. A silver salver will be given for the second best essay.

GRENIER'S RUBBER NEWS COMPETITION.

A silver trophy, value £50, will be given for the best and one, value £15, for the second best samples of Commercial rubber taken from bulk shipment, and grown in Malaya, Borneo, Java, Sumatra or Indo-China.

TROPICAL LIFE COMPETITIONS.

Gold medals are offered for Ceara Rubber, Sisal Hemp, Coconut Fibre, Robusta Coffee, Copra, Hand and Power Spraying Machines.

NEW IDEAS FOR THE USE OF PLANTATION RUBBER.

A first prize of 75 guineas, and a second one of 25 guineas are offered by the Mincing Lane Tea and Rubber Share Brokers' Association for some new ideas in the carrying out of which plantation rubber may be commercially used on a large scale.

Other competitions are limited to special localities (outside Malaya), while the President offers a trophy for Cotton and prizes are also given for wild rubber.

AFRICAN OIL PALM IN MALAYA.

BY F. G. SPRING.

During the past year the Department of Agriculture has received many inquiries with regard to the cultivation of this palm and it is hoped that the present article will, to some extent, help planters and others who are interested in the subject.

The African Oil Palm has long been grown in this country but only as an ornamental plant. It has been in the Botanic Gardens, Singapore since 1895, whilst in Kuala Lumpur and several other towns in the Federated Malay States there are many trees 10 year old and upwards; it is to be seen in a number of private grounds. It is only recently, however, that its financial aspect has been considered.

The palm is indigenous to West Africa but is abundant almost all over tropical Africa. It has been distributed all over the world and is to be found growing luxuriantly in most tropical countries. It is found in greatest abundance from Sierra Leone to the Cameroons where it occurs in dense forests practically inexhaustable and according to authorities as yet almost unworked.

"The commercial supplies of palm oil are obtained mainly from Southern Nigeria, Sierra Leone, the Gold Coast Colony, the Cameroons, Dahomey, the French Congo. Togoland and Angola but in recent years there have been exports of palm kernels from many other countries." (Bulletin of the Imperial Institute 1909, Vol. VII, No. 4.

Description of the Tree.

"The full grown oil palm may attain a height of about sixty feet, and consists of a stem covered throughout its length with the bases of dead leaves, and bearing at the apex a crown of large, pinnate leaves, each of which may be fifteen feet in length. The fruits are borne in large bunches termed "heads" or "hands", which are small and numerous when the tree first begins to bear but decrease in number and increase in size in the next few years; as many as thirty "heads" may be formed at first, decreasing to anything between two and twelve as the tree ages. The fruits are usually from one to one and a half inches in length, and three quarters to one inch in diameter and are roughly egg-shaped. The fruits are reddish brown or orange in tint. The fruit is botanically a drupe and consists of three well marked portions. Outside is a layer varying in thickness and composed of a soft fibrous pulp, carrying from fifty-five to sixty-five per cent. of an orange-coloured, semi-solid fat, which when extracted constitutes the palm oil of commerce. Inside this pulp is the palm nut, consisting of a hard woody shell, which may vary considerably in thickness, enclosing usually a single palm kernel, though sometimes two or even three are present; the kernel is the second useful product of the palm fruit; it is dark reddish brown or almost black externally, and internally consists of a rather hard, white "flesh" loaded with oil, which when extracted constitutes the "Palm-Kernel oil" of commerce. The tree is very slow growing, and it is estimated that it attains its full height of sixty feet in about one hundred and twenty years." (Bulletin of the Imperial Institute, 1909, Vol. VII, No. 4.)

Cultivation.

The Oil palm is propagated from seed, only seed from eight to ten year old trees and upwards should be used for planting purposes as those from young trees are extremely small and in all probability would not give as good results as seed from mature trees.

The nursery beds should be raised, made of fairly rich humus soil and near a water-course if possible to ensure the proper humid-

ity of the soil. The seed should be planted about eighteen inches apart each way at a depth of from one to one and a half inches. The seed is said to take from four to five weeks to germinate but I find in this country they may take as long as three months. The beds require to be artificially shaded and in dry weather regularly watered. When the seedlings are a foot high they may be transplanted into their permanent quarters which should be about 25 feet apart. Holing similar to that of planting rubber is greatly beneficial.

The tree would appear from its distribution in Malaya to thrive on most soils but a rich humus fairly damp but well drained would in all probability give the best results. Judging from reports the rainfall is an important factor but Malaya is well adapted in that respect.

In West Africa it would appear that the palm is cultivated only to a small extent and then in a rather primitive manner, the natives depend entirely on wild forests for their supply of palm fruits. It is a question whether a well managed plantation in this country where good rail and transport facilities will be financially as successful as collecting fruits from the African forests.

Palm Oil cultivation would lend itself well to a catch crop such as coffee as the palms give little shade until they are from six to eight year old, and then probably not too dense to interfere with the growth of catch crops.

Yield of Fruit, Etc.

The following is taken from the Kew Bulletin of Miscellaneous Information, No. 4, 1909.

"The age at which seedling oil palms come into bearing varies slightly in different places, and appears to depend mainly on the situation in which they are planted.

"The fruits take from two to six months to mature, according to the season of the year at which the inflorescences are formed. In the Gold Coast, according to Evans, the young plants commence to yield their first crop of fruits when about five years old when grown on the rich alluvial lands, but not until the sixth or seventh year in the hilly country, and gradually to increase their yield for 60 to 80 years.

"According to some informants the palms commence bearing in their sixth year, and bear only two or three bunches of fruit, the fruits being small. During the next five years the number of bunches increases from 4 to 6 per year, and in the twelfth year the palm yields its full harvest. Freyburger, quoted by Gruner, states that the bunches of fruit do not become more numerous as

the palm grows older, but that both the bunches and the individual fruits increase in size. A young palm, six years old, according to him, bears 1 to 6 small bunches of fruit, whilst one of 10 to 20 years of age has only 1 to 6 very large bunches with well developed fruits.

"Thomson gives the following particulars as to the growth and yield of the Oil palm from the Western Province of Southern Nigeria.

"On rich newly cleared forest soil, the oil palm is said to bear its first bunches of nuts when it is seven to eight years old. The first bunches are small, about the size of a man's fist, and from eight to thirty of them are formed on the plant annually. As the latter gets older, the bunches increase in size, and number only between four and twelve. When the palm is fully grown, that is at about the age of from eight to ten years the bunches of nuts reach their maximum size, and are developed at the rate of from two to twelve per tree per annum. This rate of yield is continued afterwards practically throughout the natural life of the palm.

"The limits between which the yield varies in the case of full grown trees are given below:—

(*a*) Full grown trees yield from about two to twelve bunches of nuts annually, each bunch weighing from 20 to 56 lbs. according to size.

(*b*) An average-sized bunch contains at least 200 nuts, and the weight of the latter varies from 7 to 21 lbs.

(*c*) The annual yield in oil of a tree is at least 7½ lbs. in weight."

The Bulletin of the Imperial Institute referred to previously states that in the ordinary variety of Palm Fruits from the Cameroons the pulp contains 60.3 per cent of palm oil while the kernels contain 48.9 per cent of palm kernel oil, in an average sized head of fruit.

In Kuala Lumpur Gardens the number of "bunches" to a tree and the number of nuts to a "bunch" compare favourably with the figures quoted; in one bunch there were over 400 nuts. The trees in the Experimental Plantation, Kuala Lumpur, commenced fruiting in the fifth year and produced fair sized bunches with well developed fruits.

CONCLUSION.

The Palm Oil industry would appear to be handicapped in West Africa by transport difficulties and lack of machinery. This industry is practically in the hands of natives and as long as it re-

mains so it is unlikely that machinery will be used to any extent on account of the cost.

Transport and machinery are two very important factors and if the Oil Palm is ever grown to any extent in Malaya it would be greatly advantageous to have oil factories at one or two stations where all plantations could send their fruits. This would avoid the installation of expensive machinery on individual estates, and small plantations where machinery is out of the question and would save a large sum on the transport of nuts.

THE PHILOSOPHY OF PIPING AS A PREVENTIVE OF PALUDISM.

By C. Strickland, M. A., B. C., Cantab:

Travelling Medical Entomologist, Federated Malay States.

The subject of this paper—subsoil drainage as an anti-malarial measure—is scarcely a purely agricultural one, but on the other hand it touches so closely the interests of the planting community that perhaps no excuse need be offered for its appearance in a Journal devoted to the Science of Agriculture.

With regard to this subject we are it seems come to a time when it would be well to wash the slate clean to write something new on it, to clean-weed some ground and plant fresh seed on it, to sweep away cobwebs of hope which entangling our heart have made it sick: in other words to disabuse our minds completely that any of all the old anti-malarial measures tried in this country can eradicate malaria. They have been tried *ad nauseam* by many capable, enthusiastic, and patient medical men and planters, and they have all failed,*[2] with one exception, that measure of cutting down jungle and draining it when it is causing malaria, Dr. Watson's work. These old measures can only mitigate the havoc, but without decrying the mitigation of this, or any disease, we wish here to have nothing to do with it. We wish to go the whole hog, and pluck out the trouble root, stock, and barrel. Like Mrs. S. Battle no half-measures will please us. Therefore with the exception, referred to above, nothing can matter now except 'piping', and it is to the consideration of various aspects of this subject that we accordingly invite our reader's attention.

* Because of the inherent impossibility to do otherwise in this country, not because the medical men are inept as one anonymous writer in the *Malay Mail* has kindly suggested.

Of these aspects we particularly wish to draw attention to the suggestion which we will put forward that the usually adopted piping scheme should be so modified that the cost will be very considerably reduced and therefore that many who could not now think of the expense would be ready to incur what is needful in this respect. The other aspects of the subject, some of which have not been put forward before, will be treated of with reference to the questions whether 'piping' is the cheapest mode of drainage for agricultural purposes only, whether it is or is likely to be, an effective anti-malarial measure, and whether in the event of its being a success it shall be our sheet-anchor for always.

The planter at least will be glad to know the best or worst which the piping system can afford, he will lend a ready ear to anything which can persuade him he is saving the shareholders' money, he will be apathetic on the question of piping being the cheapest mode of drainage *per se*, he will take a kindly interest in anything good the future portends to have in store; and the discussion below attempts to feed these very human traits in his character.

I. Is piping the cheapest mode of drainage.

It is sometimes contended that piping is cheaper than open drainage because the upkeep of the latter is so costly, and that therefore the piping should be put in if only for agricultural purposes.

This contention seems to us to place the planter 'twixt the devil and the deep sea if he is thinking of piping as an anti-malarial measure, for on his one hand he has the devil luring him on with these seductive promises of saving him much money if he pipes, and on his other he has the deep sea whispering to him all sorts of tragedies past and to come associated with piping.

The devil however must be adjudged out of it, if only because the sagacity of a generation of planters would have soon discovered if his promises had been likely to be fulfilled. But not only this. In other countries pipe-draining for agricultural purposes has not been considered cheaper than open drainage, for otherwise it would have been utilised. And it has not been considered cheaper notwithstanding its ideal characters in every way. The advantage say of a catch-crop of lettuces over the pipes has not apparently been thought worth paying the piper for.

It is not difficult, we think, to find the reasons which have probably guided planters' instinct in this matter. For whether he open-drains or pipe-drains he will have the expense of clearing away the silt deposited by storm water if he wishes his rubber to grow

on the land, (we have this on good authority) even if we grant that piping will make his ground dry when his silted up open drains would have left it a swamp, so where does the advantage come in, the piping has been to him a super-added expense and he has nothin to shew for it. Of course if no silt comes down into the valley open drains have no disadvantages and piping them is a superadded expense also.

The system is to be regarded as a baby. If we exaggerate like a fond mother the virtues which it does not possess, the other mothers will come along at the baby show and make rude remarks about it. Instead they might say 'Oh what a dear creature..'

II. Is piping likely to be effective as an anti-malarial measure?

In this section we will consider the whisperings of the deep sea about certain tragedies, and certain other points which may help us to come to a just conclusion on this subject.

Firstly, what of a certain estate which is said to have completed the piping of an area which extends forty chains everywhere from a 'protected' area, and yet has lately had several cases of fever in the middle of this protected area? The certain estate is in Selangor and the question is being asked by planters as far afield as in Johore, for the news spread like wildfire. Now the answer is that this estate has not finished piping a forty chains radius; twenty-five chains from the protected area we discovered the breeding ground, of *maculatus* (once misnamed *willmori*), not piped, and 22 chains away was a strip of jungle which alone would be enough cause for the trouble, according to Watson's theorem, and that these breeding grounds are near enough to cause trouble is proved by the fact that *maculatus*, *umbrosus*, and *albirostris*, all fever carriers, were found in a bungalow in the protected area. We therefore are in *statu quo ante* as far as this estate is concerned—it proves or disproves nothing except the interesting fact that twenty-five chains is not far enough away from *maculatus* breeding-places to be safe. The piping system is arraigned for hazarding by default the lives of many people entrusted to its care, but the evidence given is not admissible in the trial and we can show, we think, that other evidence similarly breaks down on cross-examination.

Thus it is said that intervening rubber, or a half-way house in the form of a bungalow, may enable mosquitos at the periphery of a piped area to reach the central area by easy stages. Will this be so, for has it enabled them to do so in the Coast district?

There, a distance of forty chains from the source of danger has been sufficient to grant immunity from malaria, whether the intervening space has been occupied by rubber or bungalows or cooly lines.

Then it is said that perhaps wind will drive mosquitos from the periphery of a piped area to the central protected area: this however has not apparently happened in the Coast district, so why should it in the hills? Mosquitos certainly have been known to be driven by the wind 30 miles, in America on the desert, and they may perhaps for all we know be carried sometimes from Penang to Singapore: but this occurrence is not a factor which has had anything to do with the incidence of malaria in Malaya. Thus is there any suspicion that any estate has ever been made unhealthy because mosquitos have been only blown into it—the breeding grounds of the anophelines are always near at hand if there is fever on the estate. Or why should Lipis be healthy and Raub unhealthy if wind transports infective mosquitos up the valleys, or Batu Tiga unhealthy and Klang healthy if wind transports the noxious beasts down the valleys?

Again others object that it is not feasible always to pipe, but Engineers assert that anything can be piped from a whiskey bottle to the Ocean provided they can get a fall, say into one of the canals of Mars.

We therefore believe that the piping system is operable (expense not considered) in every situation where it could be wanted, and that nothing valid as evidence of its inefficiency has been yet established against it, except that 25 chains, as instanced by the estate mentioned, is not far enough to pipe from the protected area.

Let us now consider the following evidence in this question. Is not malaria very 'local' in her operations? Everyone says so at any rate in conversation. It is the general experience. We know too of one estate in Selangor with a whole chain of lines down a valley; they are intersected at one spot by a small side-ravine full of *maculatus* breeding places and on each side of this little ravine the malaria is terribly bad, but as soon as we descend the valley the coolies become less subject to the disease to a tremendous extent (only ten chains away), 25 chains away the coolies health is 'very fair', and 40 chains away the manager has no reason to clouden his manly brow. The experience too of the estates and towns which have commenced piping is encouraging in their general reported improvement of health.

It seems therefore that as an anti-malarial measure success will follow on piping all water say forty chains from a protected area, and none of the warnings uttered seem to be reasonable.

III.

Proposal to reduce the cost of piping without lessening its efficiency.

Now we wish to recommend certain courses which will make piping much less costly than formerly, if it is decided to instal the system, and will bring it within the limits of consideration of many poorer estates who cannot think about it at present by reason of its expense.

The piping of every drop of surface-water must be regarded as a panic-stricken measure, and a needless expense. For is it not true that it is only in collections of water of a very definite character in which anopheline larvæ breed and only some of these anophelines are responsible for carrying fever? This latter fact, if fact it is, seems to be very little appreciated and certainly never acted on. Therefore we suggest that only those collections of water which harbour the DANGEROUS anophelines should be piped, and *not until these anophelines have been found*. It is not even economically safe to say that such or such a place looks suspicious and therefore ought to be piped. We know of a hill-foot swamp at Bukit Merah in North Perak which *looks* certain to be breeding *maculatus*, but that it is not doing so may be taken from the fact that all the inhabitants of the village just at its side are malaria-free. Dr. Watson himself in his book 'Prevention of Malaria in the F. M. S.' inferred that it might not be necessary to pipe streams, perhaps only the 'eye' of the stream need be piped, and Government is proposing to conduct an experiment in draining at Tarentang in which effect will be given to this idea. We only wish to carry the matter to its logical conclusion, and pipe those collections of water which are breeding the cause of the trouble.

We recommend to the notice of the reader what the late Sir Rubert Boyce said '....accurately locate the breeding places of the enemy and thus avoid dissipating energy by attacking useless places.' What is the use of knowing that some mosquitos only cause malaria, if we spend thousands of pounds in eradicating all forms of the tribe. Probably some hardy persons will get up here and say that they wish to be convinced that only some forms of mosquitos carry malaria, but as we know this type of person we will refrain from trying to convince him,—a man convinced against his will, is of the same opinion still—confident that the world's progress will leave him behind until he fades away to nothing on the horizon, crowing to the last on his muck-heap.

Our suggestion therefore is that *only water which is breeding dangerous anophelines should be piped.*

IV. The Future.

We have now discussed the considerations as they arise at the *present time* in regard to this subject: but what of the future? Is 'piping' always to hold sway in the eradication of malaria, as it seems that it must for the moment? To this question the answer is, 'Yes, until something equally effective but with other greater advantages is discovered'? .

But I think it was our old friend Hippocrates who enunciated the maxim that an ideal drug should cure certainly, quickly, and safely—*certe, celeriter, tuto.* Modern Hippocrates think however of the properties of elegance and cheapness. Now if the State Engineer of the old physician's day had been accustomed to lay down pipes in the ravines and rubber plantations of his Grecian home the hippocratic humour would almost certainly have included 'piping', not to mention the whole gamut of preventive medical measures, among those things whose virtues should be those given above—certainty, quickness, safety, elegance, and cheapness. How does 'piping' live up to these virtues? We must admit,—in answer to this,—that we think that it subserves the qualities of certainty, quickness, and safety: we would say that it is as certain as anything could be, the results as quick as the Engineers do the work, and that ulterior safety is not imperilled, but with regard to the other two qualities, elegance and cheapness, it will be said by Scot, Pict, Angle, Celestial, or Malay, that they are absolutely possessed by the system in varying degrees according to his individual conception of these virtues. There can however be no latitude in view when piping relative to other methods is regarded, and so I hope that some more elegant and cheaper way of putting salt on the *jintek-jintek's** *tail* than hitting him on the *head* with a hard pipe—a measure which seems just as stupid as an elephant shoving a flea—will be discovered in the future, a measure also infinitely cheaper. Could anything in the eradication of a disease be more ideal than Dr. Watson's prevention of malaria on flat land by cutting down jungle and draining it; a method certain, quick, safe, elegant in a sense, and cheap. And there is no reason why something equally effective apart from piping should not be discovered in the future for the eradication of malaria on the hill-lands. Therefore *Piping* is let us say for the present, not for the future.

Conclusion.

We at the outset endeavoured to justify a consideration of 'piping' from various aspects. In detail we hope to have carried complete agreement on this point, and especially when we came

* Mosquito larva.

to suggest the modified scheme of piping so as to reduce the cost. The subject is big, the issues vital, and the workers so few, that there should be no room for prolonged disagreement, unfriendly criticism, or an exhibition of enlarged spleen. Two and two always make four *we* think, but let us listen awhile to the critics who say it makes three, and finish up by saying 'Tiga s'tengah'.

A spectre stalks over the land with ghastly visage and stealthy steps and death-dealing touch. It is the duty of all to all join to lay him, it is no use maiming him merely, and then the brows will unwrinkle of those whom we wish here to take the opportunity of thanking for their cordial assistance in our work, and for their cheery hospitality.

LIMING.

By B. J. Eaton.

The following notes on the application of lime to soil and its beneficial effects have been written at the request of an F. M. S. planter, who suggested that an article on the subject would be of interest to planters in general. An article on this subject by the writer appeared in the Agric. Bulletin, S. S. and F. M. S., Vol. X, No. 9, in September 1911, but the interest taken in manurial problems and the cultivation and amelioration of the soil on estates in this country during the last year is sufficient to warrant the preparation of these notes, which are slightly modified from those mentioned above.

Lime may be considered generally as a secondary or indirect manure, except under special circumstances, as it has a secondary action on the soil, improving its physical, chemical and biological conditions. Although lime as a direct fertilizer may not be essential to the growth of the Para rubber tree, and, in this country magnesium salts in the soil may take its place, it must have an indirect action in liberating other essential plant foods, such as potash and phosphoric acid, rendering nitrogen more available and correcting acidity in peaty soils, lightening the texture of heavy clay soils and improving the non-cohesive properties of sandy soils. To those who have lived in the southern counties of England bordering the coast, and have seen the numerous "chalk pits" which abound and the large dressings of this material which are often applied even today, the "white cliffs of Albion" have a practical as well as a sentimental value.

Deficiency of Lime in F. M. S. Soils.

Analyses of Malayan soils by Barrowcliff, the writer and others have shown that these soils are usually particularly deficient in lime and, in general, the proportion of magnesium oxide to calcium oxide is greater than unity, whereas in most European soils the reverse holds.

Whether magnesia can suitably replace calcium on rubber soils is questionable; for certain crops in other countries a high ratio of magnesia to lime is considered detrimental. An analysis of Hevea latex by Barrowcliff, from trees grown in this country, has shown that magnesium salts are present, but that calcium salts are absent or present only in minute quantities. Whether this is general for latex from Hevea trees in different parts of the country remains to be seen. Seeligmann on the other hand has stated in his book on "Rubber and Gutta Percha" that calcium salts and no magnesium salts were present in Hevea latex examined by him.

I do not think that this has any important bearing on the quality of the latex or resultant rubber, as the action of salts of both of these metals on latex, when added as a coagulant or in quantities insufficient to cause coagulation, is very similar. The contradictory analyses however indicate that the salts are mutually replaceable in latex—depending probably on the nature of the soil in which the trees are grown.

Origin of Lime.

Lime, in agricultural practice is generally taken to mean Quicklime or "Slaked lime", i. e. Calcium oxide or hydrated oxide of calcium. The former is derived from the harder limestones, such as are found in parts of this country, or from the softer chalk, so prevalent in parts of England, which consists of Calcium carbonate; the quicklime is obtained by "burning" the limestone etc. in kilns, by which the carbon dioxide gas is evolved and lumps of quicklime left behind. The most valuable quicklime for agricultural purposes is derived from limestone and chalk which is comparatively free from magnesium carbonate.

Slaked lime is prepared from quicklime by treating the latter with water, when the lumps disintegrate to a fine powder. For agricultural purposes the "slaking" is usually performed by placing the quicklime in heaps of one or two cwt. in the field and covering with soil, allowing the atmospheric moisture to cause the "slaking". If exposed to the air, in a comparatively dry atmosphere the lime may hydrate slowly and absorb carbonic acid from the air and be reconverted to carbonate, in which form it is less valuable. In

this country however, where the atmosphere is so moist, quicklime may be placed in open heaps and is usually completely slaked by allowing to stand overnight, during which time it probably absorbs very little carbonic acid. The fine powder of "slaked" or hydrated lime can then be easily spread. One ton of limestone produces approximately ½ ton of quicklime, and one ton of the latter produces about 1⅓ tons of "slaked" lime.

The practice of liming is one of the oldest arts in agriculture and its origin is lost in the realms of antiquity. In former times, very large dressings were applied; the more modern practice of subsoil drainage for heavy soils has resulted in the use of smaller quantities for improving the physical properties of the soil.

It should also be borne in mind, that excessive and prolonged liming eventually exhausts the soil by depleting the food reserves.

Advantages of Liming.

The value of lime as an indirect fertilizer is threefold:—

1. Mechanical:—It improves the texture of heavy clay soils by coalescing or coagulating the fine particles of clay into larger aggregates, allowing better circulation of air and moisture in the soil which are so essential to root development.

   It binds together very sandy soils, and, together with the growth of green manures, which should precede the application of the lime, or the mulching of bulky organic fertilizers to conserve moisture, is of considerable value on such soils. This action may appear somewhat paradoxical, but the preparation of cement by mixing sand and slaked lime is well known in building operations.

2. Chemical:—It liberates potash from its insoluble compounds with silica present in the soil and phosphoric acid from iron phosphates, etc.

   Lime acts on nitrogenous organic substances and causes the production of amonia hence it should not be mixed with organic nitrogenous fertilizers or farmyard manure; it also assists in the formation of nitrates, and nitrites which are used directly by plants.

   The acidity of peaty and sour soils is corrected by adding lime. The most satisfactory test for acidity in soils is to ascertain whether such soils turn red litmus paper or solution blue; soils which act in this way undoubtedly require liming, even if calcium salts are present.

3. Biological:—The biological and chemical effects produced by liming are closely associated, since the beneficial bacterial flora which is increased and stimulated by liming acts principally

on the nitrogenous substances present in the soil and converts them into easily assimilable forms. Nitrogen is usually present in an organic form, and, before it can be utilised by the plant is reduced to ammonia and must be subsequently oxidized to nitrites and nitrates which can take place satisfactorily only in the presence of a free base, such as lime, so that the acid formed is neutralized.

Recent experiments by Russell and Hutchinson at the Rothamsted Experimental Station, England on the partial sterilization of soils by heat, and by organic solvents such as toluol, carbon bisulphide, etc., have been extended to a study of the effects of lime, and the results indicate that lime, if added in sufficient quantity, also causes partial sterilization, destroying the harmful protoza and subsequently causing an increase of the bacterial flora essential to plant growth.

Lime is also effective in destroying mycelia of Fomes semitostus and other fungal mycelia present in the soil which may be injurious to cultivated plants.

Method of Application of Lime.

Lime, as stated before, is best applied by "slaking" quicklime in heaps in the field, natural slaking by atmospheric moisture being preferable, as a finer powder is obtained in this way than when water is added in large quantities at a time.

A dressing of $\frac{1}{4}$ to $\frac{1}{2}$ ton of quicklime per acre may be used on ordinary soils of good texture in this country and larger dressings of 1 to 2 tons on very peaty and clayey soils. Unfortunately lime appears to be somewhat costly in the F. M. S. (one dollar per pikul or about $17.00 per ton with transport in addition) and in liming, as in other manurial or cultivation experiments, control plots should be maintained, and observations as to growth of the tree or yield of latex or both should be carefully made on the untreated and treated plots, in order to ascertain whether the effects are commensurate with the cost.

Experiments are being carried on by the Department to ascertain whether "ground" limestone, which is comparatively cheap (about $1.60 per cubic yard weighing $\frac{7}{8}$ ton) can be substituted for quicklime or slaked lime on the estates in this country, especially on peaty soils.

In applying lime, the surface should be forked over, as otherwise if the soil surface is baked and hard, the lime may be washed away by a heavy rain. Lime should always be applied several months before the application of other manures or fertilizers and in the case of trees of 3 or 4 years or older may be broadcasted between

the rows; in the case of young clearings shallow trenches about 3 or 4 inches deep at a radius of two to six feet should be dug round the tree, according to the age of the tree and development of lateral roots and the lime applied in these trenches.

Concluding Remarks.

I should like in closing this article, to impress on all planters and other investigators the necessity of accurate control and observation in all field experiments in liming or manuring or other agricultural operations. Unless large badly yielding areas are being treated on the advice of scientific officers, where, by means of investigation, the cause has been ascertained and the remedy is known, all field work should be carried out on plots of at least 1 or 2 acres with control plots. In the case of rubber trees, if the trees are being tapped, observations as to yield should be made for two or three months on each plot before any treatment is commenced, and, if there are differences, the control or blank plot should be the one producing the better yield so that any increase of yield on the treated plots is then almost undoubtedly caused by the treatment. Similarly, where girth is used as the method of measuring effects of treatment, the control plot should contain trees having the largest average girth, if any difference exists between the various plots. These differences, either of yield or girth or other measure, should not be large, otherwise the comparison would be unfair.

THE DRAFT WATER HYACINTH EXTERMINATION ENACTMENT IN KEDAH.

In the *Agricultural Bulletin* of the Federated Malay States, Vol. I No. 6, page 228 is a short article by Bancroft on the water hyacinth (*Eichhornia crassipes*) which gives some account of its appearance and distribution and makes mention of the harm that it does in choking up rivers and water courses generally. This plant occurs in some quantity in certain parts of the Malay Peninsula and in many places threatens to inflict a considerable amount of damage by choking up drainage canals. In Kedah, according to information received from the British Adviser, the spread of the plant has been so vigorous that it now threatens to cause very serious harm to the drainage system of the rice growing areas; so much is this the case that it is proposed to introduce legislation in that State for the purpose of eradicating it.

According to the statements made in the Objects and Reasons of the proposed Enactment the plant was introduced into Kedah some five years ago by—it is said—some Chinese who found that the leaves afforded shelter, whilst the roots supplied food to the fish in the "fish-ponds". From the "fish-ponds" the plant has spread into the canals and has badly infected the Sanglang and Sungei Daun canals which are in consequence receiving special attention from the canal officers.

According to the terms of the proposed Enactment it will be absolutely prohibited for any person to permit the water hyacinth to grow in any place upon his land, and it will be the duty of every penghulu of a mukim to serve a written notice upon any person in whose land he sees this plant growing requiring that person to destroy the plants within 7 days from the date of the notice. If any person fails to comply with the notice he will be summoned before the Court and on conviction will be punished by a fine of not less than $5.00 and not more than $50.00 at the discretion of the Magistrate. Half the fine will go to the Penghulu, Further, it will be the condition of the lease of every Government "fish-pond" that no water hyacinth plant be allowed to grow in it, and if any plant is found growing in it, the lease will be immediately cancelled.

In certain parts of the Federated Malay States serious harm is being caused to drainage systems in the same manner as in Kedah and it will probably be necessary to deal with this plant as a pest in the sense of the new Pests Enactment in all such districts. The plant can easily be destroyed by removing it from the water, allowing it to dry on the bank and then burning it in heaps. It would be necessary to re-examine the cleared drains or canals after an interval of a few weeks to make certain that no new plants were growing from seeds or from small offsets which had escaped attention at the first clearing. Moreover, much additional trouble and expense could probably be avoided at the second examination, if the first cleaning up were carried out as far as possible before the plants have had time to flower, and if the work were done thoroughly and completely. The plant spreads very rapidly and any small portion of it left in the water or on the sides of the canal or pond is capable of annulling in a short space of time the beneficial effect of the work done. As the plant can spread from ponds to canals, it would be necessary to eradicate it from all pieces of water of whatever nature within the district in which it was to be destroyed.

F. W. S.

EXPERIMENTS AT SUNGEI TENGAH, SARAWAK.

Comparison of Daily versus Alternate Day Tapping.

We have pleasure in publishing the following notes on some tapping experiments by Mr. E. Hose. The results show that under the conditions of the experiment, alternate and every day tapping gave very similar yields for approximately equal amounts of bark removed. This result is not the same as that obtained in the experiments carried on in the Kuala Lumpur Experimental Plantation (see *Agri. Bull.*, Vol. I, pp. 60, 296) where every day has each time given increased yields over alternate day tapping.

We should have preferred to have had experiments on trees with a more uniform previous history, and for them to have been carried out for a longer period. But they do indicate the possibility of soil and climatic conditions affecting not only the yield, but also the best methods of obtaining the best yield, and show that every planter should be an experimenter. Planters in the F. M. S. will not need to be reminded that the Department of Agriculture is always ready to assist them in planning and carrying out experiments.

Ed. *Agri. Bulletin.*

Trees 4¾ years old, planted 17′ x 17′, each division consisting of 200 trees having as nearly as possible an equal average girth at 3 feet from the ground (about 17″); no abnormal trees were included.

The trees had been previously tapped daily on their West face for various length of time, the longest for one year, others for 9, 6 and a few 3 months. They were originally opened with a basal "V", and where large enough, i.e. having a girth of 16″ or over, top cuts were put on, on the left quarter up to a height of 5 feet.

For the experiment all trees have been tapped on the East side.

Division 1. Was marked off with a basal "V" at 20″ from the ground, this to last 1½ years daily tapping.

Division 2. Was marked off with a basal "V" 12″ from the ground and a second "V" above this at 21″ from the ground, (i.e. 9″ between the cuts) this to last 1½ years alternate day tapping.

Tappers. Experienced Javanese, who were interchanged every 28 days that figures were recorded.

No second quality latex is shewn as the latex brought in is coagulated in the buckets without straining etc.

12% loss in weight on wet rubber has been allowed.

The period over which the figures have been collected, spreads from November 1st. 1912 to June 27th. 1913, which includes our wettest months; the actual rainfall was

1912.	November	15.67 inches.
	December	27.26 „

1913.	January	38.61	inches.
	February	36.17	„
	March	16.16	„
	April	13.87	„
	May	15.35	„
	June	6.31	„

Our average per year is 150″, more or less, during January and February some of the trees were often flooded, sometimes for 2 or 3 days together.

Soil. Stiff clay subsoil, with moderately friable surface.

Wintering. By the 15th of June, half the trees were losing their leaves.

Tapping. The common straight ⅜″ gouge was used and an average of 30 cuts to the inch was obtained.

Figures Recorded. The actual number of days on which figures were recorded was as follows:—

No. 1. Division	168 days.
„ 2. „	82 „

and an allowance should thus be added to No. 2 figures to compensate for the 2 days short.

The heavy rise in No. 1 Latex during the 5th period may be accounted for by careless tapping resulting in cambium wounds. The work otherwise has been good.

Only one spout is used on No. 2 Division placed 6 inches below the bottom "V".

THE ACTUAL FIGURES OBTAINED ARE:—

		Division 1.	Division 2.
No. 1. Latex.	1st 28 days. ..	232.75	203.50
	2nd „ ..	350.50	283.25
	3rd „ ..	446.75	480.75
	4th „ ..	403.75	601.
	5th „ ..	750.75	585.25
	6th „ ..	492.25	521.
		2,676.75	2,674.75
Picked Scrap.	1st 28 days. ..	44.	48.75
	2nd „ ..	47.80	50.72
	3rd „ ..	51.	46.25
	4th „ ..	48.50	77.50
	5th „ ..	34.75	50.50
	6th „ ..	30.	29.50
		256.05	303.22

Bark Scrap. 1st 28 days.	..	66.	58.75
2nd ,,	..	66.75	58.75
3rd ,,	..	61.	71.
4th ,,	..	65.75	70.50
5th ,,	..	68.	74.25
6th ,,	..	61.	79.50
		388.50	412.75
Grand Total Wet ozs. ..	..	3,321.30	3,390.72
Less 12% L/W. ..	..	398.55	406.88
Dry Rubber from 200 trees	..	2,922.75	2,983.84

July 24th, 1913.

E. Hose.

THE LOQUAT.

The Loquat or Japanese Medler, *Eriobotrya japonica*, Lindl., is a native of Japan and China and belongs to the Natural Order Rosaceae. It forms a handsome tree of medium size, and produces small oval fruits of a sweet and delicate flavour. The leaves are large, thick in texture, glabrous on the upper surface, the under covered with a soft white down or tomentum. Flowers are produced on the extremities of the twigs in short pendulous racemes and are white; the peduncle and pedicels also covered with white tomentum. It thrives in most warm countries, and is largely cultivated in France, where quantities of fruits are gathered yearly and sold for dessert. In the south of England it is cultivated as a flowering shrub. usually on south walls; it seldoms fruits on account of the late period of planting. At the Tea Gardens, Taiping Hills, altitude two thousand feet, it has become established and promises well. The plants, five in number, from three to six feet high, have already produced several fruits and with good cultivation should prove a useful asset to the scanty collection of possible fruits for Hill stations in the Federated Malay States.

W. L. Wood.

DEPARTMENT NOTE.

Mr. N. W. Barrit, Economic Botanist, Department of Agriculture, F. M. S., resigned his appointment on August 9th, 1913, owing to ill health.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Places of Destination.	Exported during July, 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber, 1913, to date.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons	Tons.	$	$ c.
Straits Settlements ...	357.88	4,684.75	5,042.63	3,284.51	1,758.12	...	15,410,004	383,487.33
United Kingdom ...	1,175.74	4,895.81	6,071 55	3,981.25	2,090.30	...	18,160,604	454,015.10
Continent of Europe ...	181.94	609.63	791.57	574.33	217.24	...	2,369,021	59,225.52
Ceylon	65.78	293.17	358.95	220.42	138.53	...	1,091,808	27,295.20
America	...	...	...	10.08	...	10.08	...	...
Other Countries ..	...	...	...	...	...	...	...	...
Total ...	1,781.34	10,483.36	12,264.70	8,070.59	4,204.19	10.08	37,031,437	924,023 15

KUALA LUMPUR,
6th August, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of July, 1913.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Khota Bahru	...	143.	82.2	90.93	73.64	17.29	78.	874	75.2	.78%	...	8.96	.92
Malacca, Durian Daun Hos.	29.856	150.	82.3	87.3	72.2	15 1	79 3	965	...	.87	E.	4 46	1 75
N. Sembilan, Dist. Hospital Seremban	...	147.8	78.9	87.1	70.9	16.2	75.4	820	73.	82	S. W.	7 03	1.60
,, Dist. Hos. K. Pilah	...	151.6	81.	...	...	...	76.8	842	74.	.79	...	1.55	0.45
,, ,, Tampin	...	157.5	80.2	88.4	73.3	15.1	76.1	.821	73 2	.79	...	4.40	1 35
,, ,, P. Dickson	...	155 6	81.5	87.4	73.7	13.7	77.4	858	74.6	.79	...	7 94	2.49
Pahang, ,, K. Lipis	...	...	81.	89.3	69.	20.3	75.3	...	...	...	...	2.67	0 95
Penang, ,, Penang	29.789	140.2	82.7	88.5	73.6	14 9	77.5	871	74 2	.78	...	4.58	1.29
Perak, ,, Taiping	...	108.	84 15	94.	72.	22.	77.96	.874	...	75	...	3.29	1.39
,, ,, Ipoh	...	...	82 25	92.	70.	22.	76.75	846	...	.77	...	1 65	.37
,, ,, T. Anson	...	...	82.93	91.	69.	22.	79.53	.963	...	87	...	5.52	1.10
,, ,, P. Buntar	...	...	82.02	92	72.	20.	77.25	.872	...	.81	...	3.24	.89
,, The Cottage	...	...	...	..	...	...	...	...	...	...	...	4.23	1.35
Selangor, General Hospital Kuala Lumpur	...	146.	81 6	88.5	73.8	14 7	77.9	.888	75.6	.82	...	2.63	.70
,, Dist. Hos. Klang	..	...	81.5	88.0	73.5	14.5	75.7	...	...	...	...	4.32	.97
,, ,, K. Selangor	...	...	...	87.6	70.	17.6	...	...	...	...	...	6.26	2.54
,, ,, Rawang	...	...	...	91.9	72.2	19.7	...	...	...	...	...	2.59	1.07
Singapore, Kandang Kerbau Observatory	29.884	155.	83.2	91.4	72.	19.4	77.8	.882	...	.78	S. E.	4.58	2.07

THE

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No. 3.] OCTOBER, 1913. [Vol. II.

PROGRESS REPORT ON LOCUST WORK SINCE JUNE, 1913.

BY H. C. PRATT AND F. W. SOUTH.

The casual observer in Negri Sembilan and Selangor cannot but have been impressed with the very marked increase of locusts which has taken place in this country during the period which has elapsed since Christmas last. Their appearance before this date was confined to comparatively few centres and the swarms were by no means large. At the present time there are numerous flying swarms of locusts in Negri Sembilan and this in spite of the fact that approximately in round numbers 150,000,000 hoppers were destroyed in this State during the month of June and July. The destruction of these insects was largely carried out while the work was in an experimental stage and not more than 10 coolies per day on an average were employed. It should also be borne in mind that the swarms dealt with were small and scattered necessitating successively removing the apparatus in the course of one day for distances varying from ½ to 8 miles at a time. It was found impossible even with the aid of motor transport to remove and set up the apparatus more than three times in one day. On an average such swarms cover an area of 50 yards square.

In Selangor on the other hand at the present time (Sept.) the majority of the insects are in the hopping stage and only a few flights have been reported during recent weeks. The area covered by the swarms of hoppers varies enormously in size, the range being approximately from 50 yards square *i.e.* 2500 square yards to 600,000 square yards. Such swarms are numerous, especially the latter, in comparison with those that have been found previously. The insects composing them are in all stages of their development from the minute black hopper just hatched from the egg to the large yellow and black insect in the 5th stage of its development

which unless destroyed will reach the flying stage in a few days' time. These swarms are mostly confined to big tracts of waste land, principally mining districts where the vegetation is not abundant, but where sparse lalang and other grasses are readily available. Such swarms come under public notice only occasionally when they cross or travel along the roads. At such times, however, judging from recent notes and letters in the newspapers, some interest is taken in their appearance, although they are not given so much prominence as the flying swarms.

Distribution.

As has already been stated locusts in Negri Sembilan are now almost entirely in the flying stage and may be found practically all over the State. A few swarms of hoppers occur in the Coast District near Port Dickson which are being destroyed by the special Assistant to the Agricultural Inspector, recently appointed to take charge of the work there. Provision is now made as regards staff and labour for dealing with the progeny that must needs result from these somewhat numerous flying swarms. The apparatus required however is at present deficient owing to the exhaustion of the supply of necessary material available locally. It is expected that this will shortly be remedied.

In Selangor hoppers did not commence to appear until the beginning of August after which swarms have been reported in increasing numbers up to date. The first swarms were found at the end of the Damansara road and these were dealt with as efficiently as was possible. Since that time numerous and large swarms have developed in the mining land near Setapak village, along the Ulu Gombak and Klang Gates roads, near the Rifle Range, in the neighbourhood of Ampang, on the Circular road as far round as Pudu road, and the Race Course. Other swarms have made their appearance on the Sungei Besi road up to the 5th mile, in the Chinese Cemetry under Petaling Hill, on the Petaling road as far out as Batu Tiga, at the European Hospital and in certain other localities near Kuala Lumpur.

The district round Kuala Kubu and also that round Rawang especially in the direction of Kuala Selangor, form two other centres of distribution and at a moderate estimate 100 swarms occur in these two localities. The locusts are also developing at and near Kajang along the Kuala Lumpur-Kajang road and on the Cheras Sungei Besi road. Others again are reported between Klang and Kuala Selangor. Thus there is in Selangor alone a formidable list of swarms that must be dealt with in the course of the next four weeks if they are to be destroyed at all, as after that time they

will be fully developed and it is not possible to deal effectively with the flying insects.

So far as is at present known the only reliable report of locusts in Perak refers to one swarm which flew over Tapah Road a short time ago. Other rumours have reached the Department but have not been substantiated. The extensive open tracts of land in Perak formed by abandoned tin mines would provide admirable breeding grounds and offer facilities for much more rapid increase than has taken place in Negri Sembilan or Selangor. Every effort is being made at the present time to prevent their spread in a northerly direction especially in view of the large areas of padi and young coconuts which would be laid open to their attacks.

It may be noted before proceeding to the next portion of the subject that during 8 days in the month of August, this being all the time available from work connected with future organisation and the inspection of the swarms reported daily, a total of about 16,000,000 insects was destroyed with the aid of a gang averaging 10 coolies each day. From September 1st to September 20th during which time the newly appointed officers have been at work approximately 80,000,000 hoppers have been exterminated and nearly the whole of these were in the Kuala Lumpur district and with one set of apparatus. They represent a very small proportion of the total number of swarms requiring to be dealt with, and it has been the object of the officers in charge of the work to deal with the large swarms first, while special attention has been devoted to the Kuala Kubu district as being the most northerly point of their present distribution in the hopping stage.

Food Plants and Damage Caused.

By far the most important of the food plants of these insects are those belonging to the family of grasses, more especially lalang and love grass found commonly along all the roads. These form their staple food supply and as long as they are confined to this diet, the locusts cause but little damage beyond giving a temporary check to pastures. Should their numbers continue to increase, however, at the same rate as they have done in the last few months the supply of these plants would be insufficient and the insects would be driven perforce to turn their attention to several other kinds of food especially coconuts and padi to which even now they are distinctly partial. Reports have reached us of damage done to both these crops in certain districts, though at present it is comparatively limited. Young coconuts have been destroyed outright by continued attacks of flying locusts and hoppers eat down

the padi to below the water line, swimming about from plant to plant in the padi sawahs and crossing intervening streams to obtain it.

Of garden plants the popular bamboo is very liable to be attacked and several handsome hedges have been temporarily damaged near Seremban and Kuala Lumpur. It is remarkable to observe the rapidity with which a swarm of hoppers will utterly defoliate even a thick hedge of this kind. Tennis lawns and Golf greens or courses, not to mention padangs and race courses, have been rendered brown and unsightly by these insects in the course of a few hours. In the Malay kampongs sugar-canes, bananas and pine-apples as well as padi and coconuts are eaten but not at present to a serious extent. Some damage is also inflicted on Chinese gardens.

In the case of rubber very little harm has been done up to the present, except where flying insects have settled on the branches in sufficient numbers to break them by their weight or to snap the main stems of younger trees. They will occasionally nibble the edges of fresh rubber leaves but do not appear to care for them. Only when they are dry enough for the latex to become coagulated or to lose its properties will the locusts eat them with any relish. Should their numbers increase largely serious damage might be caused to rubber by breakage alone.

Methods of Dealing with Them.

It has been mentioned before that numbers of insects have been destroyed and it is proposed now to give a short description of the method employed for this purpose.

It is not possible in the space available to give a detailed description of the apparatus, and a further publication will shortly be issued by the Department.

The methods most commonly used in other parts of the world where conditions are similar is the driving and pit system. Such a system is suitable in this country only in the case of small swarms where a large amount of labour is available. To use this method generally would entail the employment of an immense labour force and much expense in digging ditches, for in dealing with a pest so general as locusts the character of the native, whether indolent or industrious has to be taken into consideration. Moreover the hoppers are able to make their way out of pits of almost any depth unless killed upon entering them or prevented from escaping by a gang of coolies or other means. Certain planters here have used this method successfully with very small swarms of hoppers but require a large number of men in proportion to the

result obtained. The method can only be recommended where the apparatus about to be described cannot be obtained. One method of dealing with the hoppers which is successful, where the nature of the country permits of its employment, is to drive the hoppers into drainage ditches or other small collections of water where kerosine has been applied to the surface. Although able to pass a barrier of water, and to continue alive in water for a considerable time, the film of kerosine on the surface of the water rapidly causes their death. These methods are however merely side issues to the one now adopted in this country.

Arsenical poisons would probably prove effective if applied on a large scale but the promiscuous poisoning of grasses which would be essential is fraught with too much danger to native owned cattle, pigs, and other animals to make extensive application desirable. It is hoped however, in the near future, to test its efficacy under certain conditions and with special precautions.

Spraying with kerosine where used in strong emulsion on the young hoppers is very deadly in its effects. Up to the present the damage it causes to the rubber fittings of the sprayers has prevented its employment on a large scale. It is also rather expensive. In spite of these drawbacks it is intended to continue experiments with this emulsion on the assembled swarms in the early morning and evening; between the hours of 6 and 7 in the morning and 6 and 7 in the evening, it is the habit of the hoppers to congregate into dense masses when on account of the cool atmosphere and absence of sun they are stationary.

The mainstay of any method in a country such as this consists in driving the young hoppers into V or W shaped enclosures which end in special traps constructed for the purpose. These traps are very portable and do away with the necessity of digging ditches and are most successful in preventing the escape of the insects once they have entered. They were designed by the Entomologist with the assistance of the Assistant Agricultural Inspector Mr. Norris, and can be erected in the course of three minutes by three coolies. They consist of strong canvas bags, brown or white in colour, preferably the former. The entrance to the bag is two feet high and is approached by an inclined plane 4 feet each way, which is also the width of the bag. The remaining two sides and back of the bag are 4 ft. 6 ins. high and the two sides are prolonged into two wings 4 ft. in length and attached at the bottom to the sides of the inclined plane. The whole is supported by iron stakes furnished at the top with hooks from which the bag is suspended by steel rings sewn on to the material at the corners. The same means is also used to support and stretch the wings. The shape

of the bag is preserved by 4 bamboo poles run through folds two feet from the ground. These bamboos are held in place by iron stakes with rings at the top. Against the front bamboo the inclined plane is stretched being held in position by a bamboo run through a fold at the bottom and fixed to the ground by short iron or other stakes. To prevent the escape of hoppers below the wings and inclined plane a little earth is thrown on the wings and in front of the inclined plane.

The escape of the hoppers from the bag is prevented by strips of American cloth from 6 ins. to 12 ins. wide which are sewn on the inside from the height of the opening downwards. The sides of the V or W enclosure consists of strips of strong calico 4 feet 6 inches wide and in length of 15 yards. This material is very portable. On the inside two parallel strips of American cloth 6 inches wide are sewn at the height of 3 feet and 4 feet from the bottom. At the top is attached a rope strongly sewn on with twine leaving apertures every inch. The sheeting is suspended from iron stakes 4 feet 6 inches in length furnished with a hook and over which the rope is hung. The sheeting is held down by a continuous line of soil, this being always available. A quarter of a mile of this apparatus can be placed in position before an advancing swarm by 10 proficient coolies in half an hour. Moreover it is easy when the swarm is inside the enclosure to cut off their retreat by closing the open end of the V or W. It has been found that when a large swarm of hoppers has eaten out the available food supply behind it that they will pour into trap bags for eleven hours without stopping necessitating the erection of further traps, or changing those that are full, and this with practically no driving. It is a remarkable sight to see these insects hopping towards the trap, pouring up the inclined plane and dropping into the trap in a stream that is almost as regular as a stream of water, killing each other by their weight and struggling inside the trap. Circling out of the V may occur but can be stopped either by placing subsidiary traps on the arms of the wings and facing the original trap, or that which is easier by modifications in the erection of the sheeting. In most cases it is desirable to drive the swarms by means of coolies placed behind them.

In one instance in the neighbourhood of Setapak village with 3 traps, 300 yards of sheeting and 15 coolies, 40 bushels of the young 2nd instar, under very difficult circumstances were destroyed, this would be in round number about 2 million insects. The swarm of which only a portion was caught during the day, extended right through the village and for ½ mile along the high road. The hoppers were eating the food displayed in the shops, entering the

food that was being cooked, choking the concrete drains, and affording a source of annoyance to the housewives, a source of amusement to the children, and a handsome feed to the fowls and ducks of the village.

Organisation.

Special measures for dealing with this pest have already received the sanction of the Government and provision has been made for the necessary expenditure connected with the organisation recently started. Five Special Assistants have been appointed and have been supplied with the adequate labour force. It is hoped also that the delay in the supply of apparatus will soon be overcome and that they will be enabled to deal with much larger areas than is at present possible and in Malay districts to requisition the services of natives of the country.

Three of these officers are now in Negri Sembilan and two in Selangor. They are responsible to the Assistant Agricultural Inspectors in each State to whom all enquiries and all information regarding the position of breeding grounds and swarms should be addressed.

Rewards have been offered to natives for information as to the locality of breeding grounds or hoppers, and by this means hundreds of swarms have been located. There is, however, a danger that in a country such as this many may go unobserved. Every effort will be made to overcome this as it affords the chief obstacle to the successful eradication of the pest. It is, however, confidently hoped that in the course of 12 months a very considerable decrease in the numbers of locusts will be recorded.

The Department takes this opportunity of thanking District Officers, Land Officers and planters for their assistance, especially in locating swarms and breeding grounds as well as in other matters.

THE ROSELLE.

The Roselle (*Hibiscus subdariffa*) is fast becoming popular as a horticultural product, on account of its usefulness as a preserve and its wine making properties. The plant grows and fruits well in this country and in fact all over the tropical world.

Seeds of this plant were sent to this Department from the Philippines and were received here last May. These were sown almost immediately and the result is they have grown and fruited well, within four months of sowing.

Very little has been written about the roselle in this country and it appears to be very little known. Yet it should be quite a useful crop on a small scale for both Europeans and natives on account of the pleasantly acid flavour of the preparations made from the plant; a flavour which strongly resembles that of the cranberry. Considering also that the requirements of the plant are so few and its cultivation so simple the roselle should become an indispensible plant in every garden.

It would appear that the culinary uses of the calyces were first appreciated in Jamaica early in the eighteenth century[1] for although the acid properties of the plant were known by those who described it after its first appearance in Europe, there is no evidence that they were aware of the utility of the calyces; and yet the use of the leaves for pottage or "greens" was known in Java as early as 1658. Notwithstanding the early mention of the roselle from Jamaica the plant has never become of much importance in the W. Indies. In India it has been grown chiefly for its fibre; the leaves and young plants of the stem are also used in the latter country as a vegetable.

The roselle has long been cultivated in Mexico, parts of Central America, the W. Indies, and during the last few years interest has been taken in it in South Florida, Texas and California. It has been reported to be a horticultural crop of some prominence in Queensland, Australia, but in later years the cultivation has dropped off in that country. About 20 years ago[2] two preserving factories are reported to have been in operation there, and roselle jam is said to have been exported to Europe in large quantities in 1896[3]. Granting that the authorities quoted were correctly informed it would seem that the roselle preserving industry in Queensland has suffered a decline, since the Census in the annual report Queensland Dept. of Agriculture 1909 gives as under cultivation there, only about three acres producing about 781 bushels of calyces.

The roselle is a native of the Old World probably India and adjacent Islands. It was recorded in Europe in 1576[4] but it is not known how it was introduced there. The plant had found its way into a Botanical Garden in England as early as 1596[1] and was probably brought from there to Jamaica . It was not recorded from that island however, until more than one hundred years later. The roselle was introduced from Jamaica to Florida in

1. Sloam H., Natural History of Jamaica.
2. Semler H. Die Tropische Agriculture 1892 p 391.
3. Rep. Cal. Agr. Expt. Station 1896-1897. p. 582.
4. Philippine Agr. Review No. 3, 1912.

about the seventies, or eighties of the 19th century and was first grown in California from seed sent from Australia about sixteen years ago.

The plant was known in Java about the middle of the seventeenth century; yet it seems very little known in this country, and it was not until quite recently that it was introduced into the Philippines and then from the Western Hemisphere.

The Roselle somewhat resembles the cotton plant in habit and branches profusely. The leaves are, on the young plant, entire, and as the plant grows change to palmately five parted, sometimes rather obscurely so, the leaves in the axils of which the flowers are borne are three parted or entire. The flowers are large pale yellow with a dark red eye, almost sessile, and usually borne singly in the leaf axils. In rich soils, (if the plant are well cared for and have a moist season to grow in) they sometimes exceed 6 feet in height with a like spread.

Two very distinct types of Roselle exist; one containing a red pigment that gives the brilliant red colour so characteristic of all products made from the plants of this type, and one type lacking this pigment, all parts of the plant being greenish and the calyces straw coloured or whitish. The jelly made from this latter type of roselle is straw or amber coloured.

Varieties:—While the usefulness of this plant for fibre and for culinary purposes has been known for some time the roselle is of so comparatively recent cultivation that there has scarcely been time for the splitting up of the species into many different varieties.

De Candolle in his "Origin of Cultivated Plants" published in 1882 does not mention the roselle; this points to probability that its cultivation was only taken up within quite recent times. A variety having green stems and leaves with straw coloured or white calyces was recorded by Hughes in his Natural History of Barbadoes 1750 p. 204 but how long it had existed before that is not known.

Among the red stemed type there seems to have been no distinct varieties recognized until "Victor" was named in 1907, by Mr. P. J. Webster now Horticulturist to the Philippine Bureau of Agriculture. This variety originated among a number of seedlings grown by him in 1904 at the Subtropical laboratory Miami Florida. The strain from which this variety originated had been introduced into Florida from Jamaica.

The following descriptions are quoted from the Philippine Agricultural Review Vol. v. No. 3, p. 126.

"Victor:—This variety is distinguished by having the unifoliate leaves of the young plants change early into leaves deeply

five lobed, these leaf characters remaining until the flowering period when the leaves become three parted, or again unifoliate. The stems and calyces are reddish. The pollen is a golden brown. The calyces average about 45-50 millimetres in length and 28 millimetres in equatorial diameter, tapering towards the apex. The calyx lobes are longer and more slender than in "Rico" and are curved upwards. The Victor is more upright in habit than the Rico and somewhat earlier in fruiting due probably to its having been cultivated in florida for several years.

"Rico:—The young plants of Rico retain their unifoliate characters longer than Victor, and later are mostly tripartite instead of five parted. The stems and calyces are dark red and the leaves golden yellow. The calyx is of about the same length as the Victor but of greater equatorial diameter; the fleshy spines subtending the calyx lobes are stout, and stand at nearly a straight angle from the axis of the fruit; the apex of the calyx lobes are frequently uncurved.

"Rico has been described from plants grown from seeds obtained by the writer from Mr. J. E. Higgins horticulturist of the Hawaii Agricultural Experimental Station and has probably descended from a variety grown in 1902 at the Agricultural Experimental Station Mayaguez, Porto Rico by Mr. O. W. Barritt, now chief of the division of Experimental Stations of the Philippines.

"The white fruited roselle is of more upright growing habit than the Victor or Rico, but is less vigorous than either. The calyces are very much smaller than those of the above named varieties and are whitish or straw coloured."

Cultivation:—The roselle will thrive in any good soil that is moderately rich in the necessary plant foods. It grows quickly and requires abundant moisture but well drained land is necessary for its well being.

Too much nitrogenous manure should not be supplied to these plants as they tend to develop into large plants at the expense of their fruitfullness. Stable manure should therefore be only sparingly supplied and this should be supplemented by phosphates and fertilizers containing potash.

The seeds should be sown thinly in a seed bed made up for the purpose and from there transplanted to the field or garden when the plants are about 5-6 inches high. The transplanting should be done preferably on a dull day, or late in the afternoon. Before removing the plants from the seed bed they should be well watered and the majority of their leaves should be cut off. In transplanting make a small basin round each plant and water it

well, unless the soil is fairly well moistened or the work is performed in rainy weather.

Before transplanting the land should be chankolled or dug deeply and the soil well pulverized as the plants have a rather deep growing root system.

The plants should be transplanted in rows about 6 feet apart and about 4 feet apart in the rows. If the object is to utilize the leaves and stems for syrup, jelly, etc., or if the plants are grown for fibre the seeds should be sown thinly in drills about 3-4 feet apart.

During the early stages of growth the weeds should be kept down by frequent cultivation; as soon as the plants have attained sufficient size and spread to shade the ground and choke the weeds cultivation may be discontinued.

If the plants are pruned to within fifteen inches of the ground after the crop is gathered the plants will sprout again and give a second crop of fruit. It is doubtful however if this treatment is preferable to the handling of the roselle as an annual and making a new sowing for each crop.

Yield:—Mr. P. J. Webster* "found that the average yield of the Victor variety in South Florida was 5·6 kilograms per plant from the first bloom: the second bloom yielded 1·7 kilograms, making a total of 7·3 kilograms. This variety planted 2·5 by 3 meters apart, 1,300 plants to the hectare, would produce in round figures 9,500 kilograms of calyces per hectare if every plant bore its proper quota of fruit. In Hawaii a yield test of a variety obtained from Porto Rico indicated a crop of from 6,750 to 7,875 kilograms per hectare."

Henrickson‡ quotes the yield of the ordinary roselle as four pounds per plant averaging two pounds of calyces and adds ' 'Plants observed at Pueblo Viejo in sandy loam were estimated to yield double that amount."

The writer found that plants grown here yielded about 2½ lbs. per plant from the first picking. These plants were planted very close together and on poor soil so this yield cannot be taken to represent the yield of plants grown on fairly good soil with plenty of room to develop.

The yield of herbage in the Philippines was found from experiments carried out there to be:—From the first cutting April 10, 3,900 kilos per hectare from plants about 50 centimeters in height. These were cut down to about 6 to 10 centimeters from the ground, the weeds were hoed out between the stubble and the

* The Philippine Agricultural Review No. 3, 1912.

‡ Bul. 171, Office of Expt. Stations U. S. A.

land irrigated. The stubble sprouted again and within one month the field was ready for the second. This yielded 4,300 kilos of herbage. A third cutting of 9000 was made in July 2nd. Two or three rows of stubble were then taken out and the middle space cultivated,thus leaving the old rows of plants 1·8 meters apart. Again the plants started to grow and were allowed to blossom and fruit.

The first harvest of calyces was 2,120 kilos made on October 31st. The second November 14th, yielded 2,300 kilos, the third December 11th, 1,800 kilos, a small fourth gathering was made in January, but was unrecorded. The total yield in round figures was 17 tons of herbage and 6 tons of calyces. If grown from the calyces alone experiments in Florida and Hawaii indicate that an annual crop of more than 6 tons of fruit per hectare may be expected.

From these figures it would appear to be a profitable crop providing a market could be found for the products. This is where the drawback would appear in cultivating this plant commercially, as there are no preserving factories within easy reach of this country to whom the produce may be sold. It is a plant that may be grown however by every one on a small scale for culinary purposes, and as the plant appears to grow and yield well all the year round, by successive sowings of seed the fruits may be had continuously.

Roselle preserves:—Jam and sauce can only be made from the calyces but jelly may be made, not only from the fruits, but from the leaves and tender stems. That made from the herbage lacks that brilliant colour and transparency which distinguishes the jelly made from the calyces, neither does it form jelly so readily. Both herbage and calyces make an excellent table syrup which may be used in making cooling drinks. In the West Indies a wine is made from the calyces.

In making jelly it is not necessary to remove the seedpod from the calyx; this must be done however in making jam and sauce. The seeding is done by cutting off the stem and basal end of the calyx and forcing the seedpod through the apex.

Jelly is made from the calyces as follows:—Rinse the calyces well, put them in a saucepan (of granite, porcelain, or if iron it should be enamelled on the inside as the juice corodes metal) with just enough water to cover the calyces, boil them until they are soft, strain the mass through a cloth bag, measure the juice and add an equal amount of sugar, liquid measure, and boil until jelly is formed, which will be in from 10-20 minutes.

After the juice has been strained off the calyces, if they have been previously seeded, they may be made into jam or sauce. They should be washed, sugar added to taste and the whole boiled for a few minutes. Prepared in this way the calyces are excellent for eating with meat, like cranberry sauce.

For making jelly from the herbage the plant should be cut well above the ground so as to leave sufficient stubble to sprout again. When the plants are about 2 feet to 2 feet 6 inches tall is a suitable time to cut. Rinse the material and cut it sufficiently small to allow it to be placed in a boiler. Pour on boiling water until the stems are just covered after they have wilted, then boil from three to five minutes; then pour off the juice, strain, measure, and return it to the boiler and boil till the juice is reduced to about one third; then add sugar equal to the amount of the juice before its reduction, and boil until jelly is formed, which is usually from five to ten minutes. If desired lemon or lime juice may be added at the rate of one lemon to six glasses of jelly.

Syrup is made according to the same formula, but the boiling is of shorter duration; mixed with water the syrup makes an excellent cooling drink.

Another method of making syrup is as follows:—"The plant should be harvested while still of moderate growth, with tender stems and at least half matured calyces while perfectly fresh, chop the plant into length of about 10 centimeters and pack in a keg or earthenware jar. Metal containers are attacked by the acid and are not to be used at any stage of the process. Pour in sufficient boiling water to cover the plants, and then cover the keg to exclude dirt and moulds as much as possible. Allow this to stand two or three days to extract the soluble material, then filter through muslin or other suitable cloth. This gives a red liquid with a strong acid taste and pleasant fruity smell. Boil this liquid in an enamelled dish until it reaches about one-third its original volume and add sugar to suit the taste. About equal volumes of sugar and concentrated juice will usually be satisfactory. Continue the boiling with constant stirring until the sugar is completely dissolved, and bottle while hot. If desired the juice of a lime may be added to each liter of syrup. The resulting syrup has a very attractive taste and makes a refreshing product when added to water or used as a basis for sherbets, water ices, and soda water."

Roselle Wine.

"Roselle wine may also be made from the entire plant although here again a product with rich colour and better flavour results from using only the calyces. The plant is cut and treated

as in making the syrup. After filtering through cloth, the juice is placed in a clean cask previously scalded out with boiling water. For every four liters of juice use one kilo of sugar made into a thick syrup with boiling water and poured into the juice. Suspend yeast in warm water, add this to the contents of the keg and mix thoroughly by stirring. The keg should now be carefully covered or if one with the end on has been used the bung hole may be stopped with loose cotton.

To obtain a good wine foreign ferments should be excluded. The cask is then put aside and allowed to remain undisturbed during fermentation. Within a week this will near completion. If a sparkling wine is desired, the juice is racked off before fermentation has stopped and stored in bottles with corks securely wired to prevent expulsion. If a still wine is to be made, the bottling is delayed until fermentation has ceased. Age will improve the flavour and bouquet, but the young wine is very attractive in taste and appearance. As made from the entire plant it has a little reddish colour and sweet refreshing taste."

Jam.

"Wash six lbs. of fruit, open and remove the seedpod. The weight of the flesh will be about three lbs. Add two cups of water to the calyces and cook about an hour until reduced to a soft pulp. Measure the cooked fruit and add one and one fourth cups of sugar to each cup of fruit and cook twenty minutes. Six lbs. of roselles will make seven lbs. of jam." (Trop. Agriculturist Vol. XXIX. p. 51).

Roselle Fibre.

In India the roselle is grown to some extent for its fibre, which is used in the manufacture of cordage and the coarser textile products. According to Watt in his Dictionary of Economic products of India the stems yield a good strong silky fibre, the Roselle Hemp of commerce, obtained by retting the twigs when in flower. The process is described as follows:—"After the plants are dried they are made into bundles and soaked in water where they are allowed to remain for a period varying from 15-20 days. After that the bark is separated by hand and well washed to free it from impurities; it is then allowed to dry and becomes available for use." It is employed by the natives for rope making it is also said to be used in the maufacture of gunny bags in certain districts of Madras.

The roselle is a plant which suffers very little from disease. A mildew is said to attack it in Florida but has not been noticed here nor in the Philippines.

The most serious enemy to the plant seems to be the root knot nematode (Heterodera rudicicola). A cheap and effective remedy for this pest has not yet been found and infested lands should not be planted. As far as I know this has not appeared in this country. Several minor insects pests have been reported to attack the plant but none have been noticed here.

On the whole the roselle is a most useful plant and can be used for a large number of purposes. Its cultivation on a large scale is handicapped except for fibre on account of its being little known and the lack of preserving factories in or near here. As I have said before however it is a plant well worth growing for its many household uses. According to report the leaves make a good vegetable; and the calyces and stems, jellys, sauces and jams which resemble closely in flavour those similar products from the cranberry; these laths have been used as a substitute in jam making.

Most of the information contained in this article was obtained from articles written by Mr. P. J. Webster in the Trop. Agriculturist Vol. XXX. 1908, and in the Philippine Agricultural Review No. 3, 1912 and No. 5, 1913. The notes on the making of wine and syrup is quoted from an article by Dr. Pratt in the Philippine Journal of science (1912) Sect. A, No. 3, pp. 201-205.

J. LAMBOURNE.

KAPAYANG OIL.

(*Hodgsonia heteroclita?*)

BY B. J. EATON.

The following results obtained on examination of the seeds of a forest creeper, known locally as Kapayang, received from the Conservator of Forests, F. M. S., may be of interest, since the oil from these seeds may be possibly of economic value, if the plant is present in large quantities in the jungle, or is found to be suitable for cultivation.

DESCRIPTION OF SEEDS.

The seeds consist of a hard flat outer shell, of a dull drab colour somewhat resembling a mango fruit in shape but smaller, having an average length of $2\frac{1}{2}$ inches and width of $1\frac{3}{8}$ inches. The shell contains a soft oily kernel with a thin pericarp of a dry mealy nature.

The shell constitutes 55·3 per cent and the kernel 44·7 per cent of the whole seed.

The average weight of a nut was 36·0 grammes (= approx. 1¼ ozs.).

Oil content:—On extraction with petroleum ether, the kernels yielded 59·4 per cent of oil or fat, which amounts to 26·2 per cent calculated on the whole seed.

CHEMICAL CHARACTER OF OIL.

The oil yielded the following results on chemical examination:—

Saponification value	198·9
Iodine value	65·4
Refractive index	1·464
Specific gravity at 15·5° C	0·9164

The "titer test" was not obtained, and no separation of the fatty acids was made. These will probably be determined later.

The oil extracted by petroleum ether was light yellow in colour and liquid at the ordinary laboratory temperature (28° C). During the night however it solidifies partially and melts at about 25° C.

The following results published in Lewkowitsch's "Oils, Fats and Waxes" of an oil known as "Kadam seed fat" and said to be obtained from seeds of Hodgsonia (Tricosanthes) Kadam Miq., a climbing plant belonging to the natural order Cucurbitaceae, occurring in Padang, Sumatra, will be interesting as a comparison:—

Melting point	21° C
Saponification value	197·6
Iodine value (mean)	67·5

This oil is stated to consist of 80 per cent triolein and 20 per cent tripalmitin.

It is evident from these results that these oils are very similar in character and are probably derived from the same or a closely allied species.

Conclusions:—The kernels contain a large percentage of oil, and if the seeds could be obtained in large quantities would prove of commercial value, although, for export purposes, it would be advisable to remove the shell, or on the other hand, to extract the oil locally.

The oil and the seeds are used by Malays as a substitute for coconut oil for cooking purposes, and, from the fact that the seeds are supposed to be poisonous when eaten uncooked, it would appear that they contain some glucosidal or alkaloidal substance. They are distinctly bitter to the taste.

LOCUST WORK IN THE PHILIPPINES.

A Review.

A paper on the life history and methods of control of the Philippine locust appeared in the *Philippine Agricultural Review* for January, 1913.

After a brief description of the life history approved methods of control are discussed.

These are given under the following heads:—

First:—"Artificial, which includes all methods of human control, such as spraying, driving into pits, netting, crushing, burning, inoculation, poisoning, etc.," and *Secondly* "Natural, which includes influences by rain, etc."

The writers of this paper state that "by far the most important method of combating the young insects is the common pit or driving method" and that it is "almost always the best method to follow."

So far the experience gained in the Federated Malay States supports this statement, but the apparatus which is suggested for driving is cumbersome and its use would be quite out of the question in this country. Two of the main features of any campaign against the locusts, where driving is the chief method of destruction should be (1.) ease in transporting the apparatus, and (2.) the rapidity which it can be placed in position. To move large quantities of iron roofing from place to place, entails a good deal of labour and considerable expense, and when dealing with many large swarms the immense quantity of iron roofing required, in order effectively to carry out the work, would render the apparatus, at any rate in this country, quite unpractical.

The driving method is not fully described. Suggestions are made as to the size of the trenches viz: 1 metre long, 1 metre wide and 1 metre deep, and it is stated that swarms covering some 100 square yards or more should be inside the trench within one hour from the commencement of the drive. One would gather from this that the swarms to be dealt with are all small were it not for the fact that "immense swarms" are spoken of, and these I gather have a frontage of a mile, more or less. Yet no suggestion is made as to the method of dealing with these large swarms, unless it be concluded that the same iron sheeting is used. This would hardly be feasible as the quantity required to deal with a number of such swarms in one district, probably simultaneously, would prohibit its use and it would be too cumbersome to transport to the infested centres with the requisite rapidity.

Digging pits, wherein to drive the hoppers is an expensive and laborious method of dealing with them and is by no means so

effective, or cheap, as properly constructed portable traps of various sizes. A trap of the following dimensions such as is used in this country can be carried by one man: 8 yards long by 6 yards wide by 2 feet deep. For the effective driving of large swarms one should be able to set up a series of connected V's in front of the advancing swarm, and 10 coolies should be able to fix in position 500 to 600 yards of material, and several traps in the course of half an hour. This would be manifestly impossible with the pit and iron roofing system. If proper care is taken as to the position in which the traps are placed very little actual driving will be necessary. With small swarms covering, say, 100 square yards one should be able, with four men, to fix the apparatus in position, catch the hoppers, and destroy them in the course of half an hour.

The locust in the Philippines is apparently a different species from the one occurring here, but the method by which successful driving is accomplished would probably be similar in both cases. Contained in the paper are many other suggestions and statements many bearing out experience in this country. It seems a pity no description of the insect is given in any part of the paper.

H. C. Pratt.

ULU SELANGOR DISTRICT PLANTERS' ASSOCIATION.

Report of meeting held at Kuala Kubu Rest House on August 31st 1913.

The following were present:—Mr. W. De L. Brooke (Chairman), Messrs. G. E. Howard, F. G. Herose, R. M. Newton, W. Ashwim Henderson, L. W. Weddig, L. W. Tivy, A. P. Mackilligin, N. H. Dakeyne, and E. Granville Smith (Hon. Secretary).

The following visitors were also present:—Messrs. H. N. Trower, T. C. Green, N. W. Patton, G. E. Green, and E. G. Leggatt.

The minutes of the last meeting were read and passed.

In connection with these minutes the Chairman made a few remarks informing those present as to what had been done in Committee since the last general meeting on the various subjects.

Telephones. On this subject the Hon. Secretary informed the meeting as to what had been done to further the promotion of the scheme for a telephone system linking up the whole of Ulu Selangor with Kuala Lumpur and beyond.

He informed them that very considerable correspondence had passed between various Government Officials and others and himself, which had so far resulted in getting the Superintendent of Posts and Telegraphs to promise to make out estimates at once for the working of the scheme.

Three exchanges were asked for, at Tanjong Malim, Kuala Kubu and Rawang respectively.

Mr. Brooke had canvassed for subscribers to the Tanjong Malim exchange and got a list of 15. Mr. Granville Smith canvassed for the Kuala Kubu exchange and got 14.. Mr. Herose did the Rawang district and got no less than 17. It may therefore confidently be expected that the scheme will go through.

It was proposed by Mr. N. Dakeyne and seconded by Mr. Newton and carried:—That the Superintendent of Posts and Telegraphs be asked to include this estimate and work in the 1914 budget and also that he be asked to give us an approximate date when these estimates will be ready." It was felt very strongly by those present that as the matter had been so long under discussion it was only fair that the scheme should be put through in 1914, especially now that the Government have been so very clearly shewn, by the list of the subscribers, that the telephone is urgently needed and likely to be very liberally supported.

Education on estates. On this subject all members had been circularised to find out what was being done and the answers had shown that the question was being or had been attended to by all.

Chinese wages. Mr. Granville Smith proposed as an amendment, which was seconded by Mr. Dakeyne and carried:—

That every estate in this association be asked to send in a statement shewing what rates they are paying Chinese for weeding, digging and tapping, so that from these replies a list of various rates may be made out and circulated and used by all as a means to try and reduce Chinese rates all round.

Rubber advertisement. A letter was read out which had been received from the Mincing Lane Tea and Rubber Share Brokers Association re a suggested organisation with the object of fostering new uses for rubber.

After some discussion Mr. Brooke proposed and Mr. Granville Smith seconded:—

" That this Association is in sympathy with the views aimed at, but they think this is a matter for Directors of Companies to decide and suggest that the Mincing Lane Association write to these Directors on the subject. Further to assist them in the matter the Hon. Sec. be asked to enclose with his reply a list of companies belonging to the Ulu Selangor District Association." This was carried.

Discharge tickets. A letter received from Mr. Macfadyen was read re a discharge ticket system now in vogue and known as the Selangor Labour Federation.

It was shown that 74 estates, at the time of his writing, had joined this federation and that its objects were to give and take discharge tickets and thereby strike a blow to crimping.

It was felt that it was sometimes doubtful whether in all cases the rules had been strictly adhered to; further, it seems to give, as at present manipulated, ample opportunity to the coolies themselves to evade.

Moreover the Association thought that an enactment, which has been proposed and may come into force, relating to the increasing of the registration fee for locally recruited coolies, would deal a far greater blow to crimping.

After some discussion the following resolution proposed by Mr. Mackilligin and seconded by Mr. Dakeyne was passed.

That with the information at present at our disposal we are not inclined to join the Federation.

A vote of thanks to the Hon. Sec. for the trouble he had taken over furthering the telephone scheme, was carried unanimously.

The meeting closed with a vote of thanks to the chair.

E. Granville Smith,
Hon. Secretary.

KAJANG DISTRICT PLANTERS' ASSOCIATION.

Minutes of General Meeting held at 3.45 p.m. at Kajang Club 26th September, 1913.

Present. Messrs. D. Kindersley, E. M. Schwabe, E. N. T. Cummins, C. Burn Murdoch (chair), F. St. Barbe, C. G. Jeavons, F. B. Kendall, G. D. F. Sinclair, A. A. Mulloy, R. Drummond-Hay, C. P. Everard, A. C. Hayton, E. W. Tyler, H. Gough, F. B. Gough, C. H. Wilton, K. G. Furley, P. Butler, V. E. H. Rhodes, S. S. Stevens.

The minutes of last meeting were taken as read and confirmed.

Discharge tickets. Mr. Macfadyen's letter of 28th July and the rules of the "Selangor Labour Federation" were read. The matter was discussed and the feeling of the meeting on the matter was expressed by the motion proposed by Mr. D. Kindersley and seconded by Mr. E. M. Schwabe: "That, in view of the report by the Committee appointed by Government to consider the question and that other Associations do not all agree on the matter, this Association take no further action in the matter at present." Carried unanimously.

Chinese Rates. The Chairman said how desirable it was to reduce the rates and he knew every one was anxious to do so. It would be a great help in the reducing of rates if members worked together and came to an understanding in the matter. He had been in correspondence with the Negri Sembilan P. A. on the subject and our Committee had met and discussed the matter also. The outcome was that we find ourselves more happily placed than the N. S. P. A. and are able to reduce our rates well below theirs.

Further discussion on the matter ensued and Mr. D. Kindersley proposed "that this meeting agrees that the task for tapping (Cuts 2 units) should not exceed 400 trees with a maximum daily pay of 60 cents per cooly and that this arrangement be started on November 1, 1913." Seconded by Mr. E. W. Tyler and carried unanimously.

Javanese Rates. The reduction of Javanese rates was discussed and Mr. D. Kindersley proposed the following resolution "That from November 1, 1913 the rate of pay of free Javanese coolies shall not exceed 40 cents per day and Malays 45 cents per day with one paid Friday or other holiday in the month." This was seconded by the Chairman and carried unanimously.

General. The grievous conditions of the roads and telephone in the district was discussed and Mr. E. N. T. Cummins proposed and Mr. C. Burn Murdoch seconded: "That the attention of Government be brought to the very bad state of the roads and telephone in this District." Carried unanimously.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Destination.	Exported during August, 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber, 1913, to date.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,352.48	5,042.63	6,395.11	3,284.50	3,110.61	...	18,259,385	454,294.04
United Kingdom ...	833.52	6,071.55	6,905.07	3,981.25	2,923.82	...	19,884,601	497,115.02
Continent of Europe ...	129.24	791.57	920.81	574.34	346.47	...	2,641,783	66,044.57
Ceylon	47.80	358.95	406.75	220.42	186.33	...	1,190,340	29,758.50
Other Countries ...	...	...	...	10.08	...	10.08	...	...
Total ...	2,363.04	12,264.70	14,627.74	8,070.59	6,567.23	10.08	41,976,109	1,047,212.13

KUALA LUMPUR,
6th September, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of August, 1913

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Khota Bahru	...	145.	81.5	90.9	73.61	16.48	77.9	.883	75.5	.82%	...	6.49	1.15
Malacca, Durian Daun Hos.	29.861	148.6	81.9	87.2	71.7	15.5	79.	.950	...	.88	N. W.	10.67	2.51
N. Sembilan, Dist. Hospital Seremban	...	150.	79.2	88.5	71.3	17.2	75 5	.814	73 2	81	S. W.	7 26	1 61
,, Dist. Hos. K. Pilah	...	150.8	80.	...	...	...	76.	.824	73.3	.81	.	4.66	1 50
,, ,, Tampin	...	156.6	78.9	88 2	73.6	14.6	74.9	.791	72 7	.80	...	5 93	2 10
,, ,, P. Dickson	...	154 1	81.4	87.1	73.8	13.3	77.2	.849	74.3	.79	...	6 62	2.41
Pahang, ,, K. Lipis	...	...	79 9	88.8	67.2	21.6	75.	...	...	...	...	8.49	1 45
Penang, ,, Penang	29.799	141.4	81 8	88.	73.	15.	76.9	.857	73.9	.79	...	6.15	2.20
Perak, ,, Taiping	...	106.	81 4	94.	71.	23.	77.18	.882	...	85	...	3.80	1.65
,, ,, Ipoh	...	...	81 57	94.	69.	25.	76.13	.830	...	.78	...	2 59	63
,, ,, T. Anson	...	...	82 95	92.	69.	23.	78.06	.896	...	.81	...	3.86	1.10
,, ,, P. Buntar	...	...	82.07	92.	71.	21.	76.99	.858	...	.78	...	1.74	.50
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	7.55	1.70
Selangor, General Hospital Kuala Lumpur	...	145 2	82.	90.	75.5	14 5	78 4	.903	76.1	.82	S. E.	2.95	2 15
,, Dist. Hos. Klang	..	...	80.4	87.2	73.	14.2	75.8	...	...	...	...	4 34	.93
,, ,, K. Selangor	...	...	...	87.9	70.2	17.7	...	...	...	...	...	.22	.18
,, ,, Rawang	...	...	...	91.7	71.4	20.3	...	...	...	...	...	2.77	1.38
Singapore, Kandang Kerbau Observatory	29.894	152.	82.70	91.4	72.0	19.4	77.3	.858	...	.76	S. E.	2.54	.84

THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

No. 4.] NOVEMBER, 1913. [Vol. II.

THE LOCUST PEST IN MALAYA. A SHORT SURVEY AND A BRIEF DESCRIPTION OF ITS LIFE HISTORY.

BY H. C. PRATT.

The life history and general habits of the locust now present in this country is completed and it is intended to issue a special bulletin from this Department dealing with this insect embodying methods of controlling its increase. As it is necessary to await the arrival of the blocks for the illustrations some delay will be caused and it is thought that, pending this publication, a short survey of the locust pest and a very brief description of the life history of this insect will be of value and interest to many people in this country.

It will be realized that before spending a large sum of money on an organised campaign which has now been started by the Chief Agricultural Inspector and myself, it was essential, in order to combat this pest that an efficient means of dealing with it should be found. With this object in view six weeks were spent in Seremban with experimental work. During this period an average of five coolies per day were employed and rather more than 1000 kerosene tins of hoppers were destroyed. Of the several methods tried that which I eventually selected was a driving and trap system, while the success which has attended its use may be gathered from the report on the Progress of the Locust Work published in this present issue by Mr. South. One of the best guarantees of its success is the fact that the Malays in a certain part of Selangor have copied the apparatus in order to catch the hoppers and obtain the Government reward, and in order to induce a Malay to work it is usually necessary that he should perceive in the future more remuneration than his exertions entitle him to expect,

The occurrence of the locust pest in this country is attended with some interesting features. It first appeared about 20 months ago in the neighbourhood of Port Dickson and since that time, it has spread, mostly in a northerly direction over 100 miles of this country. At the same time it has greatly increased while the breeding grounds are now distributed over the whole line of its extended range, which as might be expected is largely confined to the Railways, and Roads. That the part where this pest first occurred is the most suited to it cannot be regarded as a point in favour of its being an indigenous species. There are in Malaya many other large districts which provide far more suitable areas over which this insect could breed and which are covered with a greater abundance of those foods to which the locust is partial. That this is true has been emphasised by the rapidity with which the swarms increased in the mining lands of Selangor where during the past month immense swarms of hoppers have been destroyed.

In searching for the origin of this insect in this country one is handicapped by the fact that reliable written records are absent. Vague rumours of locusts many years ago are by no means lacking. Destruction of rice crops is also attributed to them, but beyond these traditions no sound information is extant, and the investigation leaves but a hazy impression of what insect really occurred in these earlier years. It would seem that any effect likely to produce a sudden increase of an indigenous locust would hardly be confined to the small locality in which they first appeared, and would be traceable to some definite cause, as for instance weather, in which case the effect upon the increase of the insect would be more general. It would however be premature to draw any conclusion on this subject. Port Dickson has but a small external trade, and it is unlikely, yet possible, that it was introduced here.

Summary of Life History.

The eggs of locusts are laid in masses in burrows beneath the ground. These burrows are formed by the females, and they deposit in each about 40 eggs, sometimes more sometimes less. The softer soils are usually chosen for this operation which takes several hours to complete. Surrounding each egg mass, as also each egg, there is a spongy glittering substance which acts as a protection to the eggs, prevents an excess of moisture, and keeps clear the hole at the surface of the ground through which the insect ultimately escapes.

Thirteen to fourteen days after the egg has been deposited in the ground the small hopper appears. At first it is fleshy coloured but this quickly changes and becomes black with an indistinct

white stripe on the upper side of the abdomen. In from 24 to 29 days, during which time there are five moults, the winged insect appears, thus from the date on which the eggs are laid 37-44 days elapse before the insect is adult or in the flying stage, and in this state they do not live more than approximately 3 months.

The habits of the hoppers in all their stages are very similar. After issuing from the burrows they are quiet and if there is plenty of suitable food they do not as a rule leave the breeding ground. These very young ones do not generally progress very far in the course of one day. They show their gregarious instinct from the beginning collecting together at night fall or during wet weather. They are in fact sun-loving insects, and it is during the brightest hours of the day that their greatest activity is shown. They congregate in dense masses on stones or places exposed to the heat of the sun, and this love of warmth accounts for their annoying habit of settling on Railway lines.

Four or five days after hatching the first skin is cast, the insect becoming much larger, as is the case after each succeeding moult through which it passes. Before each skin is cast it is their habit to stop feeding. When the ecdysis takes place they climb any near support and hang head downwards. Very soon the skin bursts over the head and thorax and the new instar wriggles through the opening, hangs for a short while attached to the cast skin and then falls to the ground. At first it is in a very soft condition but this rapidly changes and the insect again commences to feed with greater voraciousness than before occasioned by its enforced abstinence. As they become older, and larger, they consume more food and are capable of traversing a greater distance in one day. Their activity commences about 8 a.m. when the dew is off the ground and continues with unabated energy until about 5 p.m. when they will assemble, climb the stalks of grass or other supports and rest till day break. When marching in an army and not hungry they will climb fences and trees and the sides of houses, sometimes entering the latter much to the annoyance of the inmates. Native food which is being cooked in the open air, and incautiously left uncovered is soon filled with bodies of hoppers, while that displayed in Kedehs is often covered with a mass of these creatures.

They are by nature cannibalistic devouring with avidity the dead bodies of their companions and often consuming those which are in the helpless condition of moulting. With swarms of hoppers on roads, some of which are killed when a motor car passes, the cannibalistic habit is well shown. It takes but a few minutes for the living insects to assemble and commence feeding upon the

dead hoppers and thus outlining the track of the car by reason of the dense masses of these insects.

As the hoppers become older they migrate from place to place in armies devouring the vegetation as they pass over the ground. Their tracks may be followed by the brown wastes which they have left behind them. Many of their food plants have been described in the last number of this bulletin, and their ability to swim across water was remarked upon.

After passing 5 to 6 days in the 5th hopping stage the last skin is cast and the fully fledged insect appears. The wings, as is the case with the body, are at first a milky white, and the whole insect is so soft as to be incapable of any quick movement. For several days the fliers do not move very far as they are unable to fly with any vigour. Some three or four days after wings are acquired especially if food is not abundant they commence to fly away and will pick up other swarms in other localities, or join larger flights. Thus a swarm is considerably augmented in the course of a few weeks, and although the small nature of many swarms makes them individually of but little importance collectively they become a matter for more serious consideration.

When the major part of the females of a swarm are about to lay eggs they will settle on the ground and attempts to drive them away will prove fruitless. Such swarms usually fly low on account of the gravid condition of the female which after settling crawls over the ground accompanied by a male. Oviposition does not take place immediately the swarm alights. With those swarms which have been observed in this country the first deposition of eggs in any quantity occurs the day after a swarm has settled for the purpose of perpetuating their kind, and this is most actively accomplished on the second day. In most cases there is but little sign of the swarm on the third day, many having died, while the rest have moved away.

As has been mentioned the swarms which from time to time fly over parts of this country are the result in most cases of a combination of small swarms which joining together form immense numbers of these insects. It is when in such numbers that the migratory instinct is more in evidence. There are probably many factors which play a considerable part in this habit of migration and such influences may vary in their importance. They are as a whole imperfectly understood but the chief causes may be attributed to excessive multiplication and to instinct. In the species occurring in this country the migratory instinct is not strongly developed, and it is probable that through the action of the Government to rid this country of the pest they have been checked multiplying

in such excessive numbers as to render long migrations in search of food and fresh breeding grounds essential to their existence.

Young fliers are very much more active than those composing older swarms, and they also fly at a greater height. Records show that some swarms fly at the immense height of 16,000 feet which would render them quite invisible to the naked eye from sea level. Such locusts breed very largely in the high hills in a dry rarified atmosphere and this as has been suggested probably acts as an incentive for them to fly at a great height. It is not possible to deal effectively with a swarm of fliers. The stage in which locusts are most easily attacked is during their hopping life. The method which has been found successful was described in the last bulletin, and it is hoped that some supplementary methods which might be employed by planters willing to assist the Department and who are unable to obtain this apparatus will be incorporated in the next bulletin.

THE QUALITY OF THE PLANTATION RUBBER TREE.

By E. Bateson.

A valuable result of the investigations of the Akers commission which has not hitherto been published in English is the light thrown by one of the members, Dr. Jacques Huber, on the question whether the rubber tree of our eastern plantations is the genuine *Hevea brasiliensis,* which in the Amazons produces the best quality of rubber. Dr. Huber, who is a well-known authority on Para rubber, was the botanist of the commission. To him fell the duty of studying the plantation industry from the botanical point of view, and his observations on the subject are set forth in a special report presented to the Governor of the State of Para. A copy of this report has been received by the Director of Agriculture, F. M. S., and it discloses facts of such moment to all interested in plantation rubber that they deserve to be given the widest publicity.

The suggestion that the trees introduced into the East belonged to some species other than *Hevea brasiliensis,* or to an inferior variety of that species, was made originally by Amando Mendes. It was based on two assumptions, namely, that plantation rubber is inferior to the best Brazilian rubber, and that the district in which Wickham was said to have collected his seeds yields rubber of a poor quality.

The task of verifying or disproving this suggestion was taken up by Dr. Huber, and was prosecuted in a most thorough manner.

He confirmed by independent inquiries Wickham's statement as to the locality where he obtained his seeds: he made a careful study of the species and varieties of *Hevea* occurring in that locality; and, finally, he determined whether any of these species and varieties, other than the true *Hevea brasiliensis*, were present among the trees in eastern plantations.

To the west of the lower Tapajos is a jungle-covered plain extending to the river Madeira. One of the rubber producing centres in this plain is near the river Arapium, and it was here, according to the evidence of an old inhabitant, that Wickham made his collection of seeds.

A careful search of this district resulted in four kinds of rubber tree being found. The first was a variety of *Hevea brasiliensis* which seemed to be similar in all respects to that found in the estuary of the Amazon as far as the high Purus; that is to say, it is the variety which yields fine hard Para. Its leaflets were obovate and tapered to a sharp point at the apex. The second was another variety of *Hevea brasiliensis*, with lanceolate leaflets ending in a rather dull point. This variety is thought by the natives to give rubber of a slightly inferior quality. The third was a species of *Euhevea*, probably identical with *Hevea collina*, which was originally described by Dr. Huber. It is easily distinguished from *Hevea brasiliensis* by its leaflets, which are violet in colour at the base and are somewhat different in shape. The rubber obtained from it is not equal to fine hard Para. The fourth was *Hevea Spruceana*, but this species need not be taken into account, as it grows in low places on the banks of lakes, and Wickham's collection was made on dry elevated land. Also, its seeds are so unlike those of *Hevea brasiliensis* that no confusion is possible.

With regard to the two kinds of *Hevea brasiliensis*, Dr. Huber is very doubtful whether there is any justification for describing them as distinct varieties. Slight differences in the form of the leaf are not sufficient to go upon, as such a character may be very variable: and he has, in fact, often seen both types of leaf on the same tree. He thinks, therefore, that the difference in shape is nothing more than a simple individual variation.

This conclusion, which is perfectly reasonable, leaves no ground for the supposition that the variety of *Hevea brasiliensis* occurring in the lower Tapajos valley is inferior in any way to the best variety known. The inferiority of the rubber from that region can be otherwise explained, and Dr. Huber says it is not at all unlikely that the quality of proper "strong rubber" is slightly influenced by occasional additions of the latex of *Hevea collina*.

At this stage of the investigation, then, the matter stood as follows. The forests which are the ancestral home of the plantation rubber tree contain two species of *Hevea*. One, *H. brasiliensis*, is the species witch yields the finest quality of Brazilian rubber, and from the other, *H. collina*, an inferior grade of rubber is obtained. Did Wickham's collection consist entirely of seeds belonging to the former species, or were some seeds of the latter also included?

Dr. Huber's visit to the East gave him an opportunity of answering this question. He took special care in inspecting the veteran trees in the gardens of Heneratgoda, Peradeniya, Singapore and Buitenzorg, and although they were not in flower at the time he was able to make certain, from the characters of the leaf, that there were no specimens of *Hevea collina* among them.

But of the original trees, which numbered about two thousand, only about sixty are now alive, and it was possible that some of the non-survivors belonged to the species *collina*. In that case their offspring would be found in rubber estates, mingled in smaller or greater numbers with trees of *Hevea brasiliensis*.

It was therefore necessary to pursue a more extended search, and describing the result Dr. Huber says:—"Among all the thousands of trees which I examined during my travels through the plantations of Ceylon, Malaya, Sumatra and Java, I could not discover a single one that possessed the characters of *Hevea collina*. My conviction is, therefore, that *Hevea collina* (at least as a species) is not represented in the rubber estates of the East." No hybrid between *H. brasiliensis* and *H. collina* is known in Brazil, and Dr. Huber apparently saw nothing to lead him to suspect the existence of such a form among trees in cultivation.

Dr. Huber alludes to the fact that since Wickham's consignment no seeds or plants of *Hevea* have been imported into the East from Brazil. This is certainly an important point. It means that the number of species or varieties which might have been introduced is limited to those occurring in the lower part of the valley of the Tapajos, and, as we have seen, it has been proved that none of these was brought to the East except the true *Hevea brasiliensis*.

Thus the ingenious hypothesis of Amando Mendes is shown to be utterly without foundation. The proof is all the more conclusive because it has come from the other side. There is no doubt that the Brazilian government would have welcomed a different issue, and they probably entertained hopes of dealing a severe blow to their powerful rival in the Middle East. Therefore, although the research was carried through and the result expressed with strict scientific impartiality, the personal element, if it could have

entered into the question at all, would undoubtedly have told in favour of Brazil. Dr. Huber's investigation, however, has ended in a complete vindication of the high quality of the plantation rubber tree, and the matter may be considered settled once and for all.

Two points now remain for chemists to determine: first, whether the latex from young trees is inferior to that from older trees; and secondly, whether the different methods of treating latex employed here and in Brazil affect the quality of the finished product. The settling of the first point might possibly prove the necessity of grading; and the determination of the second, with the adoption of a uniform (and, if necessary, improved) method of manufacture on all estates, would speedily lead to the abolition of the present disparity in price between fine hard Para and the highest class of plantation rubber.

ADDITIONS TO MYCOLOGIC FLORA OF MALAYA.

By A. Sharples.

The following fungi have been gathered and identified during the last few months, and are given as additions to the list published by Bancroft* in a previous issue. Further additions will be made as opportunity permits.

Cookeina Tricholoma.

The characters of the genus are given as follow:—

Plants stipitate or sub-stipitate, bright colored, some shade of red or yellow, hairy or pruinose; hairs when present fasciculate; substance tough, not shrinking much in drying; aasci 8 spored; spores hyaline or sub-hyaline, ellipsoid to fuscoid usually striate, striation consisting of light and dark bands extending lengthwise of the spore; paraphyses present, filiform.

The type species is Cookeina Tricholoma. The specimens were gathered during a recent visit to Bentong.

The following description is taken from Mycologia Vol. V, July 1913, No. 4.

Cookeina Tricholoma, (Mont), O. Kuntz

Synonyms:—Peziza Tricholoma, (Mont).
Peziza Hystrix, (Berk).
Trichoscypha Tricholoma, (Sacc).

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* Agricultural Bulletin of the Federated Malay State,s No. 7.

Pilocratera Tricholoma, (P. Henn).
Peziza striispora, (Ellis & Er.)
Sarcoscypha striispora, (Sacc).

Plants stipitate, cup shaped, with margin slightly incurved, 1-1·5 cm. diameter and about 1 cm. deep; stem often so short as to appear sessile, or 2-3 cm. long: exterior of the cup and stem entirely clothed with long hairs, which are more numerous around the margin, forming an incurved border; entire plant deep red, or nearly scarlet: axis cylindric, 350-375 × 20 microns, abrubtly extended below into a short appendage like base: spores ellipsoid to fusoid, about 27-33 × 12 14 microns, hyaline or sub-hyaline with one or two large oil drops, and granular within, usually marked with delicate, longitudinal striations; paraphyses filiform, slender, slightly enlarged upwards.

On old wood and bark.

From West Bentong—Pahang.

The species gathered were quite typical, and conformed absolutely with the above description.

Polyporus spongia, (Fr.).

Caespitose, much divided; pilei 3-6 inches across, spongy, soft, numerous, dimidiate, strigoso-velvety, ferruginous brown, when dry becoming sulphur yellow; flesh about ½ inch thick, bright brown: margin thin, incurved, soft, pores short, about ¼ inch in length: rather small, entire, sulphur coloured: spores elliptical, smooth, white.

Found at the base of a dead stump, Kuala Lumpur.

This specimen agrees with the typical description, excepting for a slight difference in the colour of the spores, which is given, in the type, as very pale yellow, almost colourless. The difference in colour of the specimen when dry is also noteworthy; in the specimens described, the dried fungus takes on a sulphur yellow colour, in the type, an orange brown coloration. These differences are not sufficient to justify any separation of this specimen as a variety of the type form.

A yellow brown colouring matter is present, soluble in methylated spirit.

Calocera stricta, (Fr.).

Simple, solitary, ½-1 inch high, linear, even when dry, yellow: base abrupt encircled with a white tomentum.

Occurring very commonly on newly opened rubber plantations on dead wood etc.

GASTROMYCETES.

Family—Nidulariaceae.

Genus-Cyathus.

Cyathus striatus, (Hoffm.).

Obconic, apex truncate, at first covered by a pale epiphragm, lead coloured and striate within, outside hirto-tomentose, brownish: peridiola subcircular, compressed 2 mm. across: spores elliptic oblong, colourless, smooth 18-22 × 10 microns.

Found growing on a laterite path, upon bits of damp wood. The fluted inside of the peridium was quite characteristic.

WORK ON LOCUST DESTRUCTION IN SEPTEMBER.

By F. W. South.

The information contained in this article is mainly summarised from the reports of the Assistant Agricultural Inspectors in Negri Sembilan and Selangor for the month under consideration. and from the fortnightly reports of the Special Assistants working under them in the various districts as well as from personal observations by the writer. The scheme in accordance with which the work is being carried on was briefly outlined in the last number of the *Agricultural Bulletin*.

Centres of Work in Selangor.

As was stated in the previous article referred to above, there were three main centres of distribution of hopping locusts in Selangor. The most northerly and therefore the most important comprised a large portion of the district of Ulu Selangor. The locust swarms there were numerous between Rawang and Kuala Kubu and were receiving special attention as it was hoped that their further spread north might be prevented. South of Rawang there were practically no swarms until the neighbourhood of Kuala Lumpur was reached when they again became very numerous especially in the plain running from under the hills round Batu Caves past Setapak village and under the Rifle Range to the Race Course. In this plain from two to four gangs of coolies were at work during the whole month. From Kuala Lumpur southwards swarms were to be found scattered over the district to points some few miles beyond Kajang; while westward they extended along the Petaling road as far as Batu Tiga. The neighbourhood of Kuala Lumpur was thus a second important centre, and the third was the district between Kuala Lumpur and Kajang. In each of these three districts a Special Assistant was posted, though the officer in charge at Kajang was not moved there until September 20th as he had first to make arrangements to commence work in

his own district of Seremban and Jelebu when the hoppers should have commenced to hatch out there.

Results. In the earlier part of the month 1 or 2 gangs only were employed by each Special Assistant in Selangor, but as fresh supplies of apparatus were obtained, and as all of it that was not required in Negri Sembilan was sent to Selangor, the number of gangs at work under each officer was increased to three or four. As a result of the month's work 5322 kerosene tins full of hoppers in all stages from the 2nd to the 5th were destroyed. This quantity represented 104 swarms. In addition 2083 kerosene tins full of hoppers were reported to have been captured by the Malays in the Kuala Kubu district working independently with their own apparatus which was copied more or less from that used by the Department.

The Position in Negri Sembilan.

Flying swarms of locusts occurred in numbers in the Seremban and Jelebu districts which form one centre of work and in the Tampin and Kuala Pilah districts which form a second centre. At the end of the month two breeding grounds and one swarm of hoppers had been reported in the Tampin district. As there was no destruction work required in the Seremban centre the Special Assistant there with his trained conductors and some apparatus was transferred to Kajang, as has been stated. The officer in the Tampin district was kept there to make observations on the flying swarms.

In the Coast district numerous quite small swarms occurred and the Special Assistant in charge there with one gang of labourers had destroyed 42 swarms amounting to 62¾ tins of hoppers in all stages from 2nd to the 5th by September 27th. He was somewhat handicapped by the difficulty of obtaining Malay labour and by the nature of the country.

Apparatus Supplied.

The deficiency in the amount of apparatus owing to lack of local material has constituted a severe handicap on the work throughout, though small quantities continued to be delivered during the month. At the time of writing, October 15, some 500 yards more sheeting is available and it is hoped that after the next six weeks 3,000 or 4,000 yards more will have been delivered or will be in course of construction. This should leave a certain quantity at the disposal of any planters who are willing to assist the Department by carrying out the work on their own estates themselves.

Damage Inflicted.

Taking the numbers of locusts into consideration the damage caused by them has not been very serious. On one estate 25 young rubber trees were broken by the weight of some recently matured flying insects which settled on them. In a few places coconut palm leaves have been badly eaten, and patches of padi have been destroyed; but much of the feeding of the hoppers has been confined to open mining country, where the temporary check to the lalang and other grasses cannot be regarded as of much importance. The damage to private gardens too is mostly of a temporary nature and lawns and bamboo hedges though rendered unsightly for a time should quickly recover in the rains that are at present of almost daily occurrence.

Present Position.

In the immediate neighbourhood of Kuala Lumpur especially in the plain on the Ampang side already referred to, most of the swarms of hoppers present during September have now, Oct. 15, been destroyed or arrived at maturity. The remainder round Kuala Lumpur and in the other districts will either have been destroyed or have reached maturity in the course of the next three weeks. One or two swarms of hoppers belonging to what may be considered an intermediate generation may remain, but the majority of the insects that occur will be flying and work will have to be greatly reduced.

In Negri Sembilan on the other hand the generation of locusts now present is in the flying stage, except in the Coast district, but it is anticipated that a generation of hoppers will soon make its appearance. It is hoped, and even more, expected, that the appearance of this generation in Negri Sembilan will synchronise with that of the flying generation in Selangor, as this will enable most of the available staff and the bulk of the apparatus to be concentrated in Negri Sembilan. It is this periodicity definite, though slightly blurred, combined with the scattered nature of the swarms which prevents work from being carried on all over the country at the same time; while it also conveys a false impression of the absence of locusts to the public.

In reviewing the situation at the present time, it is safe to state that the number of flying locusts that will escape from the destruction of the present generation of hoppers in Selangor, will be no larger, even if as large as that which was contained in the previous generation of fliers from which these hoppers arose. This is equivalent to saying that there will have been no increase in the number of locust present in this generation in Selangor over that present three months ago. When it is considered that the staff

employed has only been at work one month and that in that time numerous small difficulties attendant on the commencement of any organisation have been overcome, while in addition the officers have been handicapped in their work by want of apparatus, it is impossible to avoid the optimistic conclusion that work on the next generation of hoppers should result in a large diminution in the numbers of locusts present in the country. This conclusion is strengthened by a consideration of the enormous increase which any observer well acquainted with the size and number of the swarms of hoppers in Selangor especially near Kuala Lumpur must confidently have expected had they all escaped unchecked.

The results in the Negri Sembilan are, as stated, confined to the Coast District and the general situation does not permit any conclusions to be drawn. It may, however, be stated that every effort will be made to destroy a large proportion of the generation of hoppers that is expected to appear soon, and thus materially to lower the number of insects present in the State.

MANURIAL EXPERIMENTS WITH YOUNG RUBBER AT KUALA LUMPUR.

Second Year's Result.

BY F. G. SPRING.

A description of these experiments was published in the *Agricultural Bulletin F. M. S.* Vol. I, p. 194, and the results for the first year were then given. It may be remembered that the land on which the tests were made is not ideal for manurial experiments. It was necessary to divide the plots into two sections, namely A and B, as there was not a sufficiently large area of one description of land to carry out the required number of experiments. The nature of the soil, as pointed out in the previous article, is laterite and would appear to be below the average as regards soil fertility. The manures were forked lightly in around the trees to a depth of two to three inches, between two circles of 1 and 4 feet radius, the tree being the centre of the circle. The land was weeded once in six weeks, the control plots being weeded as often and treated in a similar way to the manured.

The increase in girth over trees of the unmanured plots for the first year is as follows:—

TABLE A.

Plot.	Fertilizer added.	Increase in girth over trees of the unmanured plots.
2	Lime, Nitrogen	1·36 inches
4	Lime, Nitrogen, Potash	1·33 ,,
1	Lime, Nitrogen, Phosphate	1·87 ,,
5	Lime, Potash, Phosphate	1·87 ,,
3	Lime, Potash, Phosphate, Nitrogen	2·35 ,,

TABLE B.

9	Lime	1·05 inches
7	Lime, Potash	1·12 ,,
8	Lime, Phosphate	1·87 ,,
12	Phosphate, Potash, Nitrogen	1·48 ,,

The increase for the second year is as follows.

TABLE A.

Plot.	Fertilizer added.	Increase in girth over trees of the unmanured plots.
2	Lime, Nitrogen	0·19 inches
4	Lime, Nitrogen, Potash	0·04 ,,
1	Lime, Nitrogen, Phosphate	0·28 ,,
5	Lime, Potash, Phosphate	0·51 ,,
3	Lime, Potash, Phosphate, Nitrogen	—0·01 ,,

TABLE B.

9	Lime	—0·58 inches
7	Lime, Potash	0.24 ,,
8	Lime, Phosphate	0·26 ,,
12	Phosphate, Potash, Nitrogen	0·15 ,,

It should be understood that the land was manured on one occasion only, namely in the latter part of 1911. The results therefore show the effect of one application of manure over a period of two years.

During the first year, the trees in the manured plots, in every case, showed a good excess in girth measurement over the trees in the unmanured plots but during the period of the second year, the increase in girth measurements of the unmanured plots are almost equal to that of the plots in which manures were applied. It is evident, therefore, that in this particular soil, the manures had good effect for one year only. This is not surprising considering the lightness of the soil, and the periodical heavy tropical rainfalls it receives. Judging from the results it would be expected that small dressings of artificial manures, applied at frequent intervals, would be more effective and profitable than larger quantities applied at longer intervals.

One point of some interest is that during the first year the plot in which lime was applied alone (No. 9) gave comparatively good results but during the second year the girth measurements do not compare favourably even with that of the unmanured plot. This may be due to the lime having reduced, to some extent, the available supplies of nitrogen and potash. As pointed out by Mr. Barrowcliff in the last article published on these experiments "In future years however future additions of lime may be expected to have less effect than in this, the first one, but those of potash and nitrogen a correspondingly greater."

The plots are to be remanured shortly with similar dressings. The results for the third year will be published when available.

TABLE. A.

No. of trees in each Plot, 120.

No. of Plot.	Manure applied.	lbs. of Manure	Date of applying Manure.	Average girth 1 ft. from ground.			Increase in girth. 1st yr.	Increase in girth. 2nd yr.
1	Sulphate of Ammonia Double Superphosphate Lime	½ lb. per tree 1½ lbs. ,, ,, 1000 lbs. per acre	14th. Nov. 1911 16th. Nov. 1911 21st. Sept. 1911	2.35 inches Oct. 1911	7.00 inches Oct. 1912	11.05 inches Oct. 1913	4.65 inches	4.05 inches
2	Sulphate of Ammonia Lime	½ lb. per tree 1000 lbs. per acre	15th. Nov. 1911 21st. Sept. 1911	1.90 inches Oct. 1911	6.04 inches Oct. 1912	10.00 inches Oct. 1913	4.14 inches	3.96 inches
3	Sulphate of Ammonia Double Superphosphate Sulphate of Potash Lime	½ lb. per tree 1½ lbs. ,, ,, 1 ,, ,, ,, 1000 lbs. per acre	16th. Nov. 1911 18th. Nov. 1911 28th. Nov. 1911 28th. Nov. 1911	2.15 inches Oct. 1911	7.28 inches Oct. 1912	11.04 inches Oct. 1913	5.13 inches	3.76 inches
4	Sulphate of Ammonia Sulphate of Potash Lime	½ lb. per tree 1 ,, ,, ,, 1000 lbs. per acre	16th. Nov. 1911 28th. Nov. 1911 2nd. Oct. 1911	2.12 inches Oct. 1911	6.13 inches Oct. 1912	9.94 inches Oct. 1913	4.01 inches	3.81 inches
5	Double Superphosphate Sulphate of Potash Lime	1½ lbs. per tree 1 lb. ,, ,, 1000 lbs. per acre	18th. Nov. 1911 29th. Nov. 1911 2nd. Oct. 1911	2.01 inches Oct. 1911	6.66 inches Oct. 1912	10.94 inches Oct. 1913	4.65 inches	4.28 inches
6	No Manure			2.35 inches Oct. 1911	5.13 inches Oct. 1912	8.90 inches Oct. 1913	2.78 inches	3.77 inches

TABLE. B.

No.of trees in each Plot, 120.

No. of Plot.	Manure applied.	lbs. of Manure.	Date of applying Manure.	Average girth 1 ft. from ground.			Increase in girth. 1st yr.	Increase in girth. 2nd yr.
7	Sulphate of Potash Lime	1 lb. per tree 1000 lbs. per acre	29th Nov. 1911 6th Oct. 1911	2.96 inches Oct. 1911	7.77 inches Oct. 1912	11.63 inches Oct. 1913	4.81 inches	3.86 inche
8	Double Superphosphate Lime	$1\frac{1}{2}$ lbs. per tree 1000 lbs. per acre	19th Nov. 1911 9th Oct. 1911	2.44 inches Oct. 1911	8.00 inches Oct. 1912	11.88 inches Oct. 1913	5.56 inches	3.88 inches
9	Lime	1000 lbs. per acre	13th Oct. 1911	2.73 inches Oct. 1911	7.47 inches Oct. 1912	10.51 inches Oct. 1913	4.74 inches	3.04 inches
10	Perlis Guano	4 lbs. per tree	30th Nov. 1911	2 72 inches Oct. 1911	7.65 inches Oct. 1912	11.21 inches Oct. 1913	4.93 inches	3.56 inches
11	Bone Meal	3 lbs. per tree	30th Nov. 1911	3.11 inches Oct. 1911	8.47 inches Oct. 1912	12.79 inches Oct. 1913	5.36 inches	4.32 inches
12	Sulphate of Ammonia Double Superphosphate Sulphate of Potash	$\frac{1}{2}$ lb. per tree $1\frac{1}{2}$ lbs. ,, 1 lb. ,,	13th Nov. 1911 30th Nov. 1911 30th Nov. 1911	3.02 inches Oct. 1911	8.19 inches Oct. 1912	11.96 inches Oct. 1913	5.17 inches	3.77 inches
13	No Manure			2.71 inches Oct. 1911	6.40 inches Oct. 1912	10.02 inches Oct. 1913	3.69 inches	3.62 inches

THE STANDARDISATION OF RUBBER PLANTATION v. HARD PARA.

By B. J. Eaton.

The recent heavy drop in the market price of raw rubber and more especially the greater disparity in price between the plantation product and Fine Hard Para, which is coincident with the general decline, has naturally been the cause of considerable interest, which has shown itself in the usual journalistic display of articles good, bad and indifferent, mostly the latter. The number of "experts" connected with the rubber industry is legion and the less their knowledge of the subject, the greater their dogmatism, reminding one of those well known Shakesperian lines "I am Sir Oracle, and when I speak, let no man ope his lips."

Whether the general fall in price is due to the increase in output of plantation product, I do not propose to offer a definite opinion, although I do not think that this can be so.

It certainly would appear however that the great difference in price between plantation rubber and the virgin product from Brazil, etc., is due to a difference, imaginary or otherwise on the part of the buyer, in the quality of the rubber for manufacturing purposes, in the case of a large portion of the plantation material.

Even in the case of one or two of the larger estates, whose rubber inva iably obtains the highest market prices for plantation rubber, this disparity in price is considerable.

In view of the recent report issued by the Consulting Chemists of the Rubber Growers' Association and judging from my own experiments, which for various reasons are not sufficiently advanced to enable me to be dogmatic on the question, I consider that this difference in market price, between the highest quality of plantation smoked sheet and Fine Hard Para, is not justifiable.

There are several factors however which must tend to cause this difference in the market. In the first place the wild rubbers from South America are all well-known and tried brands and the arrangements for grading have been in force for years. Thus the following are some of the well known grades:—Fine Hard Para, Soft Fine Scrappy, Manaos, Cametas, Islands, Bolivian Fine, Peruvian Fine, Peruvian Ball, and Mollendo Fine. If the regular auctions be studied it will be seen that the difference in prices between the highest and lowest of these grades amounts to as much as 1/6 per lb.

The variation in quality in each of these particular grades is probably small, chiefly on account of the comparatively similar

manner in which each grade is prepared or obtained, and these variations are known to manufacturers as a matter of experience.

It will of course be said that plantation rubber is also graded, but while this is true for any particular estate, the variation in the quality between different estates is probably very great, owing to the treatment which the rubber undergoes, which admits of such variation in methods. One estate manager may say "I standardise my rubber"—but what is really required is uniformity of method on all estates for each grade.

It is this lack of uniformity of rubber from different estates which is probably the principal contributory cause to the difference of price, and it is bound for some considerable period to affect the price of even the best qualities of plantation smoked sheet.

Another contributory cause, as pointed out in my report on "Visits to factories in Europe," is the fact that the method of treatment of plantation rubber on the mixing rollers in the manufactory is probably not yet sufficiently understood by the operator, who, for years, may have been working with one definite mixing containing certain proportions of one or more grades of rubber. Although there is no doubt that much of the crepe rubber produced on estates in this country undergoes excessive rolling and mastication on the washing machines, many writers who complain of such drastic treatment of the rubber, have probably never visited a vulcanizing factory and seen the mastication on warm or hot rollers to which the raw rubber is subjected before vulcanisation, for this is so drastic that it destroys the nerve and elasticity of the raw material almost entirely, and this is only regenerated after the vulcanizing process is completed. Of course, one has to remember that, in one case, we are dealing with freshly coagulated rubber which is very soft and in the other with more or less matured and hardened material, which may or may not have a different influence on the results.

In connection with the problem of rubber standardisation and the alleged inferiority of plantation Para rubber, an interesting report by Messrs. Clayton Beadle and Stevens, Consulting Chemists to the Rubber Growers' Association, has appeared recently in the India Rubber Journal, shewing the comparative results obtained in mechanical tests on samples of plantation and Wild Para rubber vulcanised under similar conditions and tested by them. From these results it would appear that the samples of plantation rubber mentioned in this report were equal to and often considerably superior to the samples of Hard Para, and that in all cases the samples passed the Admiralty test. (*N.B.* From most of the results given the Admiralty test would appear to be not sufficiently

stringent; at any rate there is a considerable margin between the figures obtained and those required by the Admiralty test).

Unfortunately however, the number of samples given in the report is very few and may represent only the quality of rubber which can be turned out by estates working on good lines.

Messrs. Beadle and Stevens have probably vulcanised and tested some hundreds of samples of plantation Para and it would have been interesting, had they either given figures for some of the poorer qualities or stated that a number (few or many) of samples gave lower values.

Their object, in this report, was, no doubt, to demonstrate, as they state, that plantation rubber should be accepted on its merits even if Fine Hard Para was specified in contracts, and their figures are satisfactory in this respect.

The manufacturer however probably realizes that, although there may be rubber from certain estates, which he can rely on using, yet he knows that much plantation rubber is very variable in quality, and it is this variability as much as the inferior quality which precludes its use for the highest qualities of manufactured goods. As stated in my recent report on "Visits to Rubber Factories," all the plantation crepe and unsmoked sheet in one large factory was mixed together and remade in order to produce a large batch of one quality—which could be subjected to a preliminary vulcanisation and test if necessary, instead of having a large number of small batches, each of which would have to be tested, and probably treated subsequently in a different manner in the factory. Variability is probably a more damaging factor in a batch of rubber than general inferiority, more especially in the case of a comparatively new product, such as plantation rubber, since, in the case of samples of wild Para rubbers, the different grades are well-known and the inferior grades can be easily selected by the buyer or manufacturer. On the other hand, unless a particular sample of plantation rubber is tacky or has some other obvious defect, it is exceedingly difficult and often impossible to detect differences of quality by appearance or any crude tests, such as hand-pulling, etc.

Probable Causes of Inferiority.

Considerable discussion has taken place recently with reference to the variety of Hevea tree cultivated in the Orient, but the conclusions arrived at are by no means definite.

In recent correspondence between the Director of the Royal Gardens, Kew (Col. Sir David Prain) the Director of Agriculture F. M. S. and Dr. C. J. J. Van Hall (Chief of Division of

Mycology) Buitenzorg, (Vide Agricultural Bulletin Vol. I, No. 77. p. 398) Sir David Prian makes the following pregnant remarks with reference to the statement by the Commission that the Orient seed was from an inferior variety. "It is to be presumed that whether it was or was not the intention of the parties making this statement to cause a certain amount of uneasiness among those interested in Eastern plantation rubber it would not be unpleasing to those interested in Brazilian rubber if the statement were correct."

Without any intention to be dogmatic, I do not think that this question of variety has any significance, as far as the quality of the rubber is concerned. Undoubtedly individual trees vary considerably in the amount of latex yielded and the rubber content of the latex. This variability in yield and rubber content of latex may be due to the age of the tree, excessive tapping, rainfall, soil, disease or to the individuality of the tree, that is to say, some physiological cause of unknown origin.

The principal cause of variability in plantation rubber is probably due almost entirely to the variation in the methods of coagulation and machining—the former including the dilution of the latex by the addition of water to the cups in collecting. One has only to visit a few estate factories to observe these variations in method. I am referring here particularly to the manufacture of crepe rubber, since more uniform and fairly standard methods must be adopted if plain or smoked sheet is made on an estate.

The editorial in the Malay Mail on the 18th September asks how many rubber growers are in possession of an absolutely correct formula for coagulating their latex, and the suggestion is made that the Agricultural Department might publish such a formula.

Such a formula and method can certainly be given to enable any estate to turn out a standard rubber, but the Department is certainly not yet in a position to state dogmatically, on the results of its own tests, that rubber prepared in this way will be equivalent to Fine Hard Para, and, till this can be stated with authority, I think it would be unwise to publish a formula, which might have to be altered subsequently.

As I have stated elsewhere, mechanical and other tests on raw rubber are unsatisfactory at present, and the only criterion is the vulcanised material. It is hoped that, as soon as the experimental vulcanising machinery has been erected and is in order, that tests on vulcanised samples prepared from rubbers coagulated and treated by various methods will indicate the differences be-

tween various grades of plantation rubber and between plantation rubber and Fine Hard Para, and will enable us to arrive at a standard method of preparing a rubber equivalent or superior to the latter. I would point out however, that already Messrs. Beadle and Stevens for the R. G. A. have issued a report (mentioned above) showing that the best qualities of plantation rubber are equal to and often superior to Fine Hard Para, but this report does not appear to have been accepted altogether by at least one of the leading rubber factories in Great Britain, and it certainly has not affected the price of plantation rubber from even one estate. Such an attitude of course may be anticipated, even if the results of these investigations are correct, as conclusions from scientific experiments often suffer the fate of other discoveries and may be only accepted after a considerable period.

A Universal Formula.

The following formula for preparing a standard quality rubber may be given tentatively, provided the methods of collection etc. are adhered to.

Latex should be collected without the addition of any water to the cups. This is already done by several of the leading estates. (Some estates maintain that this gives a larger proportion of naturally coagulated lump, which means a smaller percentage of No. 1 Rubber from first quality latex. From my own observations, this is however not the case).

The pure latex is collected separately and the cup washings collected in another vessel.

(1). Smoked Sheet.

This is now recognised to be the highest quality of plantation rubber on the market. In order to make good smoked sheet of standard quality, the pure latex, after bringing to the factory, may be diluted with an equal part of water. (The pure latex from average trees 6-12 years old, will contain from 25 to 35 per cent. of dry rubber—depending on the tapping, rainfall, etc.) and the diluted latex should contain approximately 15 per cent. of dry rubber *i.e.* 1½ lbs. per gallon of latex. (*N.B.* If the pure latex is a little low in rubber content, less water can be added. An hydrometer, which must be accurately constructed and which is being still experimented with, should be used to ascertain the approximate rubber content of the latex. It is hoped shortly to have an instrument graduated in direct rubber content).

The amount of acetic acid of 5 per cent. strength (1 in 20) recommended for the coagulation of one gallon of this latex is

2 ozs. To obtain a sheet having a good surface appearance—free from oxidation marks, a small quantity of sodium bisulphite may be used,—about ½ oz. of a 5% solution per gallon of latex. This should be mixed with the latex immediately before the acid is added.

To ensure sheets of uniform thickness, the latex should be coagulated in bulk—about 40 to 50 gallons at a time, in a large fairly deep vessel. The acid should be thoroughly mixed with the latex by means of a paddle operated by hand. There will be sufficient time to pour this latex into the coagulating troughs or pans before coagulation sets in. Each pan or trough should be filled to the top and the surface scum removed by a thin piece of wood or other contrivance. Coagulating pans holding about 1 gallon or long troughs divided up by means of movable partitions may be used, so that each sheet of rubber weighs approximately 1½ lbs. when dry. The sheets should be machined on the following day after coagulation, and hung for a few hours or overnight to drain, and then placed in a two-storey smoke house and smoked for about 10 days or a fortnight, so that an even lot of rubber is produced. Coconut husks form very suitable fuel for smoking, but further experiments are necessary with other fuel.

The temperature of the smoke house in which the rubber is hung should not exceed 110° F. and smoking should be carried on preferably only at night, to avoid the excessive heat during the day.

The sheet should be passed only once or twice through plain even speed rollers, after previous hand rolling to make the rubber firmer for handling, then once through a diamond marker, which may be an ordinary creping machine with diamond grooves.

(2). Crepe.

At present the market demand in this respect, is for pale thin crepe.

For preparing this, the latex should be collected as before and diluted in the factory to the same extent and treated with sodium bisulphite and acetic acid in bulk. In order to obtain a very pale crepe, it is necessary to add more than the quantity of Sodium bisulphite given above, and this may have to be ascertained by experiment on different estates, as latex varies in its oxidisability. The usual quantity found to be sufficient is 2 ozs. of a 5% solution per gallon of latex. The small variation necessary in the amount of Sodium bisulphite probably has no effect on the resultant rubber. The coagulated lump of rubber should be left in the coagulating jar overnight and machined next morning. At present it is difficult to give any precise recommendations re machining, but the rubber should be put through the machines the minimum

number of times necessary to produce a crepe of good finished appearance.

On one estate, the rubber is passed eight times through the machines. It is preferable, when possible, to have, say three machines, each gauged differently, so that the gauge of each machine is kept constant and each sample of rubber can be passed the same number of times through each machine. In this way exactly similar treatment will be given to each sample.

Concluding Remarks.

A later editorial of the Malay Mail has suggested the inauguration of Test-houses for rubber in various towns, such as Singapore, Penang and Kuala Lumpur, by which is meant, presumably, Testing Stations, such as that shortly being started by this Department.

The idea is an excellent one, but somewhat premature I think, considering the amount of preliminary experimenting which will be necessary before we are in a position to issue guarantees for rubber shipped from this country, and to see how such a proposition works in practice.

I think the amount of work and the comparative slowness of research work of this or any other scientific nature is not sufficiently realized by the layman, if I may use such a term.

The results published show only the successes and not the failures or the many negative results which are obtained in the course of an investigation in endeavouring to reach the goal.

The publication of leaflets on methods of preparation etc. is excellent in its way, but I find that much more satisfactory results can be accomplished by personal visits to estates. Considering the fact however, that there are upwards of 500 estates in this country—apart from small native holdings and that it would be necessary to spend at least a day at the factory on each estate and perhaps some time in the field, it will be seen that any one estate could only be visited once in about two years. With the increase in staff of the chemical laboratory of the Agricultural Department it will be possible to accomplish this work satisfactorily, but hitherto this has not been possible: the actual period of work devoted entirely to rubber research has amounted to about six months, only sufficient to carry out preliminary work, such as was published in the Bulletin on "The Preparation of Para rubber."

These remarks are added for the benefit of those who do not realize the amount and nature of the work to be carried out, before satisfactory recommendations can be made. There is no royal

road, no Elixir of Life, no Philosopher's Stone; these were but dreams or fantasies of the alchemist of old, unsupported by fact and speculative in their nature, but by patient prolonged research involving many failures which never appear, we shall doubtless be able to arrive at the actual cause, in the case of plantation rubber, of its present defects and to apply an Elixir based on the knowledge gained and supported by facts.

MINUTES OF MEETING OF THE PLANTER'S ASSOCIATION OF MALAYA.

Held on October 5th, 1913, at Kuala Lumpur.

Present: Mr. R. W. Munro (Chairman); The Hon. Mr. G. H. Day (Legal Adviser); Mr. H. C. E. Zacharias (Secretary). and the following delegates from Constituent Associations:—

Mr. J. Milne Counsel	Bagan Datoh Planters' Association.			
,, H. E. Darby	Batang Padang		,,	,,
,, E. Dane	Batang Padang		,,	,,
,, W. N. Gawler	Johore		,,	,,
,, J. Bruce	Johore		,,	,,
,, C. Burn-Murdoch	Kajang District		,,	,,
,, P. F. Wise	Kajang District		,,	,,
,, G. H. King-Harman	Kapar District		,,	,,
,, E. W. Harvey	Kapar District		,,	,,
,, E. B. Prior	Klang District		,,	,,
,, G. C. Ash	K. Lan.	,,	,,	,,
,, F. Clyde-Jeavons	K. Lum	,,	,,	,,
,, A. J. Fox	K. Lum	,,	,,	,,
,, W. E. L. Shand by proxy Mr. A. B. Slee	K. Sel.	,,	,,	,,
,, J. W. Campbell	Malacca	,,	,,	,,
,, H. M. Darby	Malacca	,,	,,	,,
,, F. W. Collins	Malacca	,,	,,	,,
,, V. A. Tayler	N. Sem.	,,	,,	,,
,, P. W. N. Farquharson	N. Sem.	,,	,,	,,
,, W. de L. Brooke	U. Sel.	,,	,,	,,
,, E. Granville-Smith	U. Sel.	,,	,,	,,

Honorary Members:—Mr. L. Lewton-Brain, Director of Agriculture, F. M. S.; Mr. E. S. Hose, Ag. Controller of Labour, F. M. S.

Visitors:—Mr. H. C. Pratt, Entomologist, F. M. S.; Mr. G. F. Richardson.

AGENDA.

(1). The Minutes of the Meeting held on July 13th on the proposition of Major Fox seconded by Mr. King-Harman are taken as read and confirmed.

2. LONDON RUBBER EXHIBITION (1914).

The following correspondence was read:—

(1). A letter from the Secretary to Mr. C. Baxendale informing him of the circularisation of estate managers re contributions, and Mr. Baxendale's reply.

(2). Correspondence of a similar nature from Mr. C. Malcolm Cumming and Mr. A. Staines-Manders (organiser of the Exhibition) urging the importance of representation by the F. M. S. at this Exhibition. Similar correspondence between the Secretary P. A. M. and the Secretary R. G. A.

(3). Correspondence from the Secretary Planters' Association of Ceylon stating that Ceylon would be represented and enquiring re attitude of the P. A. M., together with the reply of the Secretary P. A. M. informing him of the action taken by the P. A. M.

(4). A letter from Sir Henry Blake (President Rubber Exhibition) asking the P. A. M. to appoint delegates to the Exhibition and for papers on subjects of interest connected with the industry.

It was resolved to let the question of delegates stand over, till plans of members going on leave in 1914 were known.

The Secretary reports that replies to his circulars were coming in, mostly satisfactory.

3. BATAVIA CONGRESS AND RUBBER EXHIBITION.

The following correspondence is summarised in connection with the above.

(1). A letter from the Secretary P. A. M. to the Under Secretary F. M. S. stating that the Association saw little object in sending exhibits but considered that this country should be well represented and suggesting that Government should join with the Association in sending over a strong commission to attend the Exhibition and Congress.

A reply was received from the Under Secretary to the effect that the Government proposes to send Mr. L. Lewton-Brain (Director of Agriculture), Mr. B. J. Eaton (Agricultural Chemist), and possibly another officer as delegates.

A further letter from the Secretary P. A. M. thanking the Under Secretary for the information given and stating that the P. A. M. would be officially represented by delegates.

Discussion:—Mr. Munro is in favour of Malaya being represented by exhibits as well as delegates.

Mr. H. M. Darby proposes the following sub-Committee:—Messrs. R. W. Munro, E. B. Skinner and L. Lewton-Brain, to whom all arrangements in connection with this matter should be referred. This proposal was seconded by Mr. Campbell and carried.

4. Repression of Drunkenness.

The Secretary reads correspondence of a similar nature addressed by him to the Colonial Secretary S. S., the Under Secretary F. M. S., and the Adviser to the Johore Government suggesting that the steps recently taken to reduce drunkenness amongst Indian labourers had not resulted in permanent improvement and that further control is necessary, submitting that it should be made an offence for any Indian labourer to possess, and for any person to sell or give any Indian labourer spirituous liquors of any description.

Formal acknowledgements were received from the last two and the Colonial Secretary S. S. wrote to the effect that the Colonial Government had the question of legislation under consideration.

5. Honorary Members.

The election of the Director of Gardens S. S. as an Honorary Member proposed by Mr. Prior and seconded by Mr. Darby was carried unanimously.

6. Education on Estates.

A letter from the Ag. Controller of Labour was read, to the effect that instruction must be given in the morning, but that school hours were reduced from three to two. Instructions for Tamil Vernacular Grant-in-aid Schools were also enclosed.

After discussion and remarks by the Ag. Controller of Labour Mr. Farquharson proposes that the Secretary write to the Ceylon Government asking for details as to the system in force on the island and enquiring whether the system had proved suitable. This was seconded by Mr. Slee and carried. The Secretary was also instructed to send copies of the Director of Education's "Instructions" to all Constituent Associations.

7. Rural Boards.

A letter from the Secretary P. A. M. to the Secretary R. G. A. was read informing the R. G. A. that "A special vote of thanks be accorded to the R. G. A. for their cooperation with the P. A. M.

in connection with the Labour Code. The reply of the Secretary R. G. A. was also read.

Correspondence from the Under Secretary F. M. S. to the Secretary P. A. M. and the Ag. Controller of Labour to the various Constituent Associations inviting them to appoint Committees which the Controller of Labour and other officers of the Labour Department will consult, connected with labour affecting such District Associations, the committees to be purely consultative and have no statutory powers. The officers of the Health Dept. are also to consult such Committees on matters of Estate sanitation.

The Secretary P. A. M. in his reply informed the Ag. Controller of Labour that owing to Mr. Macfadyen's absence in Burma, it was impossible for him and the Hon. Mr. E. B. Skinner as the Sub-Committee to submit a formal report in their consultations until his return.

Mr. Hose stated that he understood that more detailed proposals would be recommended by the Sub-Committee and asked that a report expressing the conclusions arrived at, might be considered and forwarded to him.

It was proposed by Mr. Fox, seconded by Mr. Burn-Murdoch and carried, that the Hon. Mr. E. B. Skinner be asked to prepare a report and submit to the Standing Committee.

8. Absconders.

Correspondence between the Secretary P. A. M. and the Under Secretary F. M. S. was read to the effect, that, under the Criminal Procedure Code, on the subject of warrants of arrest, these are generally applicable to the arrest of offenders punishable under "The Labour Code 1912."

2. Correspondence from the Secretary P. A. M. to the Colonial Secretary S. S. the Adviser to the Johore Government and the Under Secretary F. M. S. with reference to the losses and inconvenience caused by the fact that absconding was not an extradictable offence and asking that steps might be taken in this connection, was read, together with the replies.

The General Adviser to the Johore Government replied to the effect that action was being taken, which would, it was hoped within the next few months remove the difficulty and inconvenience.

The Colonial Secretary S. S. replied to the effect that the question had already been brought up by the Planters in Malacca, but that it has not been considered advisable to alter the law in this

respect. The Under Secretary replied to the effect that the subject was receiving attention.

At the suggestion of Mr. Campbell it was agreed that the attention of the Colonial Secretary S. S. be drawn to the action contemplated by the Johore Government.

9. Date of Payment of Wages.

A letter from the Under Secretary F. M. S. was read, to the effect that there did not appear to be sufficient justification for altering the law as at present in force, in respect of the date of payment of labourers' wages each month.

The Secretary P. A. M. in his reply sates that the Hon. E. B. Skinner proposes to promote a private bill on the subject for the consideration of the Federal Council at their next meeting, when it is hoped sufficient reasons will be adduced.

An acknowledgement of this letter by the Under Secretary F. M. S. was then read.

10. Indian Immigration Committee.

A letter from the Ag. Controller of Labour with reference to the free tickets from Madras to Penang or Port Swettenham issued by the Emigration officers in India, to *bona fide* Indian labour who are desirous of seeking employment in the S. S. or F. M. was read.

The Controller recommends that employers engaging such labourers, who are given certificates by the Government Agent in India, should asked for such certificates and can, by forwarding these, with the quarterly returns required under Section 153 of the Labour Code, obtain credit for such labourers as imported labourers for the purpose of calculating the extra rate under Section 156 (b). No recruiting allowances however will be paid.

2. A second letter from the Controller of Labour was read, stating that the Immigration Committee had decided to defray from the Immigration Fund, in future, all expenses of detention in depots in India, including boat hire on embarkation, commencing from the next shipment after receipt of the letter.

Mr. Slee is of opinion that the local railway fares should also be defrayed from the Indian Immigration Fund and the Secretary is instructed to write to the Committee accordingly.

11. Newspaper Agitation.

The Secretary reports the receipt of the following Resolution from the Kuala Lumpur D. P. A. "That the P. A. M. take steps to counteract the press campaign now being conducted in India

against emigration to Malaya" and lays on the table the July 1913 number of the Indian Review.

After discussion, in which it was suggested that the Government might take action, a review of the campaign was given by Mr. Zacharias and some interesting observations on the subject and a suggestion was made by him that a Brahmin gentleman previously in charge of the Indian Census work under the Census Officer should visit and report on Indian Labour Conditions on Estates and should subsequently write to the Indian papers mentioned.

This was supported by Mr. Tayler and Mr. Darby stated that the P. A. M. should bear the expenses.

Mr. Munro proposed and Mr. Prior seconded that expenses not exceeding $150 be paid this gentleman to defray expenses.

The Hon. Mr. Day intimated that in his opinion an action for libel would lie.

Mr. Burn-Murdoch proposed and Mr. Fox seconded that the Chief Secretary be asked whether the question is actionable and if so, that the Indian Government be asked to take steps accordingly. This was carried.

12. Discharge Tickets.

The following resolution from the Negri Sembilan Planters' Association was read "That the Association heartily supports the proposal made by the Committee to enquire into the Ceylon system of Discharge Tickets, which was laid before the Federal Council and would urge the P. A. M. to use every effort to induce Government to accept and bring into effect the same.

After discussion it was decided that no steps be taken at present.

13. Reduction of Wages.

A letter from the Secretary Bagan Datoh Planters' Association was read on this subject, asking the P. A. M. to take the matter in hand:

The question was then formally submitted by Mr. H. E. Darby for discussion, and Mr. H. M. Darby informed the meeting of the action taken in Malacca.

Mr. Prior proposes and Mr. Granville-Smith seconds the proposal, that the Constituent Associations be called together and their views ascertained first; each Constituent Association to send two delegates, not necessarily planters, to form a Sub-Committee for framing a definite proposal.

This was agreed to, and the Secretary instructed accordingly.

14. Labour (Varia).

1. Mr. Tayler proposes that the substitution of the number "five" instead of "ten" be made in Section 40 of the Labour Code, to prevent small estates inducing recruited coolies to leave their present employers who had recruited them. Mr. Hose thought that the difficulty might be met by eliminating the words "on a place of employment in Section 66" and it was finally decided as proposed by Mr. Jeavons and seconded by Mr. Tayler that Government be addressed on the lines of Mr. Hose's suggestion.

2. Mr. Munro also took the opportunity of warning managers against refusing to accept notice from their coolies, as such an attitude was wrong and indefensible.

3. A letter from the Negri Sembilan Planters' Association to the Legal Adviser P. A. M. asking for information on Section 143 of the Labour Code was read in connection with a particular case.

A letter from the Ag. Controller of Labour to the Secretary P. A. M. on the same subject was read in which the Controller states that under the section he had no option as to taking proceedings against the manager.

4. The Legal Adviser also suggested in connection with another case, that each estate pay a minimum by way of "wages" and give a "bonus" for special work, such as tapping.

5. A letter to the Secretary P. A. M. from the Batang Padang D. P. A. asking for legal advice with reference to charges against Watchmen under any Enactments, for neglect of or absence from duty.

The Legal Adviser P. A. M. suggested that such cases could be dealt with, under the Labour Code, by inserting in the second line of the definition of "Labour," after the word "employed," the words "as a watchman on an Estate."

6. A letter from the Malacca P. A. to the Ag. Controller of Labour with reference to the engagement of coolies transferred from estates owing to reduction of wages was read, in which it was suggested that the enactment be altered to allow such transferred labourers to be assessed at Coast Recruited rates or exemption from the extra assessment levied on locally recruited labour.

Mr. Slee also mentions the anomalous position of the Bernam district and gives notice to bring up a motion at the next P. A. M. meeting.

Mr. H. M. Darby proposes "that in the interests of the planting community and of this Association, the F. M. S. Labour Code be introduced into the S. S. as proposed with the least possible delay."

This was seconded by Mr. Campbell and carried and the Secretary instructed to address the Colonial Secretary S. S. accordingly.

15. Javanese Labour.

Correspondence between Messrs. Mansfield and Co., the Secretary for Chinese Affairs and the Secretary P. A. M. with reference to the crimping of Javanese labourers recruited by estates in this country from Java was read. The Colonial Secretary S. S. informs the Secretary P. A. M. that contracts of Javanese Labourers for places outside the Colony and the F. M. S. hitherto signed at the Chinese Secretariat, Singapore, will cease to be ratified after November 1st. The signing of such contracts was considered by the P. A. M. and Messrs. Mansfield & Co., as a direct incentive to crimping by places outside the Colony and F. M. S.

16. Rubber Dealers Licences.

Correspondence between the Secretary P. A. M. and the Colonial Secretary S. S. on the issue of licences to Rubber Dealers was then read.

The Colonial Secretary states that, with a view of giving interested persons an opportunity of showing cause why applicants should not be granted licences, it is proposed to arrange for the publication of lists of applicants for renewals before the expiry of their existing licences.

17. Agricultural Pests.

The locusts problem was discussed by the Meeting which considers that the steps hitherto taken by the Agricultural Department are inadequate.

The following resolution proposed by Mr. Campbell and seconded by Mr. Farquharson was agreed to "That this Association views with alarm the rapid spread of locusts in the country and is of opinion that the present steps taken for their eradication are inadequate.

Mr. Counsel referred to the damage caused by rats in the Bagan Datoh district.

Mr. Tayler considered that excellent work in the destruction of locusts had been carried out by the Agri. Dept. in the Seremban district.

Mr. Day also informs members, that under the new Pests Enactment, they may eradicate locusts on their land and recover the costs incurred from Government.

A description of the apparatus being used was also given.

18. Freight on Rubber.

As it was considered that, especially in view of the low price of the commodity, the present freight on rubber was too high, the Secretary read correspondence which had passed between him and the R. G. A. with reference to a combined remonstrance against the Shipping Conference.

The Secretary R. G. A. forwarded correspondence which showed that the Shipping Conference was not prepared to consider a reduction in freight.

19. Agricultural Bulletin.

A statement regarding the cost of the bulletin was submitted.

20. Export Duty.

A proposal from Mr. Macfadyean "that the rubber duty could be more conveniently collected if all grades were treated as of the same value, such value to correspond to the mean average price of the various grades at the time," was unsupported.

21. Quit Rent.

A motion intended to be brought forward by Mr. Macfadyen, was dropped, owing to his absence. Mr. H. M. Darby informed the Association that the Malacca P. A. had already approached their Government with reference to a reduction.

22. Agricultural Department.

The Secretary reads a letter from Secretary Malacca P. A. requesting the Association to approach Government with a view to extending the activities of the Agricultural Department to the Colony.

Mr. Campbell proposes and Mr. H. M. Darby seconds the motion, that the Association endorses the action taken. This was carried, and the Secretary is instructed to address the Colonial Secretary S. S. accordingly.

23. Post Office.

Correspondence between the Secretary P. A. M. and the Director Posts and Telegraphs re non-delivery of letters to Tamil coolies on Estates owing to incomplete or vague addresses was read.

The Director Posts and Telegraphs suggests that members of the Association supply their coolies with writing paper bearing the name of the Estate in Tamil.

24. STANDARDIZATION OF RUBBER.

A letter from Mr. Baxendale with reference to the stamping of crepe rubber was read which stated that the question was being considered by the Standardization Committee of the R. G. A.

A letter from Messrs. Aylesbury and Garland was also read, deprecating the use of Copper rollers in washing machines etc., owing to the well-known deteriorating effect of copper salts on rubber.

25. DAY OF MEETINGS.

Mr. Jeavons gives notice that he will propose that in future, meetings be held on Saturday instead of Sunday Morning.

The Meeting terminates at 4 p.m.

ULU SELANGOR DISTRICT PLANTERS' ASSOCIATION.

A general meeting of this association was held at the Kuala Kubu Rest House at 9.30 a.m. on Friday October 24th, 1913.

The following were present. Mr. W. De L Brooke Chairman: Mr. E. Granville Smith, Hon. Sec.; Messrs. M. J. Kennaway, G. P. Mackilligin, N. H. Dakeyne, W. A. Henderson, L. W. Weddigie, G. R. Wake, F. S. Lyne, R. M. Newton.

The following business was discussed.

Minutes of the last meeting were passed.

Telephones. The Hon. Sec. read out certain letters which tended to show that no apparent signs of further immediate progress were being given by Government to further the scheme.

It was therefore proposed by Mr. Lyne and seconded by Mr. Newton "That a letter be sent to the Chief Secretary asking him to further the scheme and that a copy of this letter be also sent to the Hon. Mr. Skinner as unofficial member." Carried *Nem. Con.*

Wages. Mr. Granville Smith was able to give the meeting the results of his enquiries as to the rates ruling on different estates in this association.

After some interesting discussion the following resolutions were finally passed:—

A. Proposed by Mr. Lyne and seconded by Mr. Brooke: "That on and after December first, 1913, the maximum rate for field work be fixed at thirty five cents per diem for Tamils and fifty cents per diem for Malays and Javanese.

B. Proposed by Mr. Wake and seconded by Mr. Dakeyne: "That on and after December first, 1913, the maximum rate for field work be fixed at sixty cents per diem for Chinese."

C. Proposed by Mr. Kennaway and seconded by Mr. Henderson: "That a copy of this resolution be sent to every member of this association and also to certain other Tamil and Chinese Planters in this district, who are not members, for their guidance."

Delegates. Proposed by Mr. Brooke and seconded by Mr. Wake: "That Mr. Newton and Mr. Granville Smith be elected as delegates to act on the special committee for considering some scheme for universal reduction of wages throughout the F. M. S. and Straits Settlements." Carried unanimously.

Locusts. A letter from the Director of Agriculture was read asking for assistance from planters with regard to (1) Labour, (2) Accommodation for Labour, and (3) information as to the locality of locust swarms.

Mr. Newton proposed and Mr. Lyne seconded: "That we are prepared to render all the assistance that we can and that a list of members of this association and their addresses be sent to the Director of Agriculture for his information." Carried unanimously.

Rates for Recruiting and Railway Freight.

Mr. Granville Smith pointed out that some of the charges in connection with recruiting were very heavy and in particular pointed out the following details:—

That Messrs. Boustead Hampshire's bills included amongst others

A charge of 10 cents per meal for coolies

Also an agency charge of 50 cents per coolie.

That Messrs. Madura Company bills included amongst others

Boat hire at Negapatam Rs. /4/- per coolie

Boat hire at Port Swettenham /3/- per coolie making a total charge for boat hire of Rs. /7/- per coolie

Supervision charges /8/- per coolie

Commission on expenditure of 5%

Further the dieting charges on his last three bills paid averaged out at Rs. 1/7/5 per head.

He further pointed out that Railway charges on rubber consignments over a distance of about 70 miles worked out at more than the shipping charges for about 10,000 miles and these latter were considered unreasonably high.

Mr. Kennaway proposed and Mr. Weddigie seconded: "That these points be brought up at our next meeting when members can come, prepared with information on the subject." Carried unanimously.

Thee meeting closed with a vote of thanks to the chair.

DEPARTMENT NOTE.

Mr. J. G. Watson, Superintendent, Government Plantations, Selangor and Negri Sembilan has been transferred to Forest Department as Assistant Conservator of Forest, Kuantan, Pahang on the 10th October, 1913.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Destination.	Exported during September, 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber, 1913, to date.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,009.47	6,395.11	7,404.58	4,458.03	2,946.55	...	20,184,421	502,040.39
United Kingdom ...	853.99	6,905.07	7,759.06	5,524.38	2,234.68	...	21,441,753	536,043.75
Continent of Europe ...	93.05	920.81	1,013.86	749.48	264.38	...	2,814,156	70,353.75
Ceylon	43.51	406.75	450.26	285.24	165.02	...	1,268,804	31,720.00
Other Countries ...	...	...	...	10.45	...	10.45	...	...
Total ...	2,000.02	14,627.74	16,627.76	11,027.58	5,610.63	10.45	45,709,134	1,140,157.89

KUALA LUMPUR,
8th October, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of September, 1913.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	146.	81.3	91.	73.83	17.17	77.8	.883	75.5	.80%	...	9.40	1.77
Malacca, Durian Daun Hos.	29.876	145.7	81.2	85.7	71.2	14 5	78.5	.938	...	.88	N. W.	15.43	3.22
N. Sembilan, Dist. Hospital Seremban	...	150.8	78.6	90.3	70.8	19.5	75.3	.816	73.	82	N. W.	10.61	2.35
,, Dist. Hos. K. Pilah	...	152.9	79.0	...	..	...	76.2	.850	74.3	.85	..	4.51	1.20
,, ,, Tampin	...	155.	78.8	87.	72.6	14.4	75.2	.805	73.	.80	...	12.62	3.00
,, ,, P. Dickson	...	154.5	81.5	87.7	74.	13.7	77.2	.851	74.3	.79	...	7.50	1.87
Pahang, ,, K. Lipis	...	...	80.2	89.2	68.7	20.5	74.9	...	...	...	...	10.35	2.42
Penang, ,, Penang	29.817	137.1	80.7	86.6	72.7	13.9	77.	.872	74.5	.84	...	22.86	4.10
Perak, ,, Taiping	...	106.	82.43	94.	71.	23.	76.95	.854	...	.78	...	11.24	2.25
,, ,, Ipoh	...	...	81.92	92.	70.	22.	76.32	.833	...	.77	...	4.87	.91
,, ,, T. Anson	...	...	82.23	92.	68.	24.	78.04	.905	...	.83	...	6.32	1.70
,, ,, P. Buntar	...	...	80.76	92.	72.	20.	75.57	.816	...	.78	...	9.79	2.32
,, The Cottage	...	...	...	..	...	...	...	...	...	...	...	27.46	3.75
Selangor, General Hospital Kuala Lumpur	...	145.9	82.	89.3	74.8	14 5	78.3	.902	75.9	.82	...	5.27	1.05
,, Dist. Hos. Klang	.	...	81.	87.1	73.3	13.8	75.9	...	...	...	...	6.65	1.90
,, ,, K. Selangor	...	...	...	88.2	72.4	15.8	...	...	...	...	...	4.09	1.50
,, ,, Rawang	...	...	...	91.2	71.7	19.5	...	...	...	...	...	7.13	1.75
Singapore, Kandang Kerbau Observatory	29.911	160.	82.2	92.4	72.	20.4	77.5	.876	..	.81	...	8.84	1.93

THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

No. 5.] DECEMBER, 1913. [Vol. II.

PADI EXPERIMENTS IN KRIAN.

By E. Bateson.

The importance of extending the cultivation of padi in the F.M.S., and the benefits which would accrue therefrom to both the capitalist and the peasant class, are now too generally recognised to need emphasising. To create suitable conditions for padi-growing irrigation is essential, and with the carrying out of the several schemes projected by Government, the next decade will see a great advance in the right direction. At present these schemes exist on paper only, but their execution will no doubt be proceeded with before long, and it seems therefore an opportune moment to make known certain results of the Krian experiments which have a bearing on the irrigation of padi land.

Irrigation Methods.

Abandoned Areas in Krian.

The Krian irrigation scheme, the only one of any size in this country, has now been in operation for seven years. It has certainly added greatly to the prosperity of the district, but it can hardly yet be called a complete success, since there are large areas, forming a by no means inconsiderable part of the total amount of land under irrigation, which it has been found impossible to cultivate at a profit.

These areas have been a source of loss to the natives, who, with surprising perseverance, have taken up holdings year by year, only to desert them on finding that they would not yield even a bare subsistence. They have also caused a waste of Government money, as there has been very little return for the original outlay on irrigation channels and the annual charges for repairs, besides which the whole of the land has had to be flooded every year for the sake of the few people who have remained in occupation of their fields.

The area of this kind which has attracted most attention is a stretch of about 9,000 acres lying between Parit Buntar and Bagan Serai. It was supposed that its unproductiveness was due to the fact that the soil had been ruined by continual inundation before adequate facilities for drainage were provided, and on this assumption experiments in reclamation by means of draining, ploughing and liming were commenced. The prospect, however, did not appear very hopeful. The disinclination of the Malay for hard work is only too well known, and, besides, the average ryot cannot afford to wait longer than a few months for a return either from his labour or from the investment of his small capital. Had it been necessary, therefore, to subject every field to a slow process of reclamation before padi in paying quantities could be obtained, most of this land would have remained untenanted, and it might have been necessary in the end to cut it out of the irrigated area.

Happily, it proves that no slow and laborious methods of soil improvement are needed in order to make the land yield remunerative crops. All that is necessary is the practice of a more rational system of irrigation. It appears never to have been realised that the water requirements of the padi plant vary at different stages of its growth, and that a depth of water which may be excellent for mature padi is fatal to newly transplanted seedlings. Hence every year there has been wholesale destruction of padi by deep water, and it is entirely to this cause that the lamentable succession of failures shown by the crop records for this land is to be attributed.

Careful control of the irrigation water has an almost magical effect on the yield. A striking example is furnished by the following table of yields from a block of land on the Siakap road near Bagan Serai, which was experimented on last season and was previously cultivated by Malays:

Year.	Area planted.	Total crop.	Yield per acre.
1911.	27.5 acres.	1,405 *gantangs**	51 *gantangs**
1912.	31.0 ,,	2,265 ,,	73 ,,
1913.	31.9 ,,	11,167 ,,	350 ,,

Increases on a similar scale to the above were obtained at other places, distant several miles from one another; and although the improved yield did not always reach 350 *gantangs* an acre, in no case was it appreciably lower than 200 *gantangs*. On a rough estimate, three quarters of the land in the area in question will yield over 300 *gantangs* an acre, and the remaining quarter about 200 *gantangs*. Instead, therefore, of the almost negligible crop it has previously given, the whole area would, under proper conditions

*gallons.

of irrigation, yield between two and three million *gantangs* of padi, or approximately 6,000 tons, and would maintain some 2,000 families.

The idea that so long as water was supplied the depth was immaterial seems to have influenced officials in dealing with another extensive piece of land at Kubu Gajah, in the *mukim* (parish) of Gunong Semanggol. An abundant supply of irrigation water is available, but no channels have been made to remove possible surpluses after rain. At the planting season this year the depth of water was between two and a half and three feet. It is hopeless to expect padi to grow under such conditions, and the consequence is that a stretch of about 5,000 acres, which should be yielding a million and a half *gantangs* of padi every year, is lying waste and producing nothing.

What makes the present position all the more unsatisfactory is the fact that the demand for padi land in Krian is far in excess of the supply. There are large numbers of people who would be willing to take up land of this description, and, indeed, the least promise of better conditions is sufficient to start the Malays applying for allotments. A single successful harvest from the experimental fields near Bagan Serai caused a rush of applicants for land in the neighbourhood, and in a few weeks about 2,000 acres were alienated. It is certain that when the irrigation conditions have been set right a couple of years will see every acre of these abandoned areas under padi.

Water Control in Other Areas.

The injurious effects of deep flooding are seen at their worst on poor land, where the seedlings, being always below the average height, are more liable to be submerged, and also in low places from which it is difficult to remove water. But where neither of these conditions obtains, a certain amount of care is often necessary to prevent damage; and as the possibility of danger was never previously realised, it is safe to assume that losses must have occurred on areas of good land provided with all needful facilities for drainage.

It is not necessary to go further back than last year to find a case of this kind. From the part of the *mukim* of Gunong Semanggol, covering about 5,000 acres, which is in regular cultivation, the crop in 1912 averaged 234 *gantangs* an acre: in 1913 there was a drop to 103 *gantangs*. Enquiries show beyond doubt that the decrease was due to deep flooding, which was thus responsible for a loss of three quarters of a million *gantangs* of padi.

What happened in this case over a comparatively small acreage might easily occur on a much more extensive scale, either as

the result of the injudicious use of irrigation water, or from the coincidence of a period of heavy rain with the planting season.

The first of these causes probably accounted for the poor harvest obtained in Krian in the year 1912, when, according to official figures, the average yield dropped from 313 to 209 *gantangs* an acre, and the total crop fell short of the previous year's standard by nearly five million *gantangs*.

The weather conditions during the planting season just over were ideal for the operation of the second cause, and but for the fact that the disastrous effects of deep flooding had been brought to light, scarcely any part of Krian would have yielded a full crop at the next harvest. As it was, unremitting effort was necessary on the part of the irrigation officials, and even then padi was damaged in a few places.

It is thus concluded that the same cause which has kept large tracts of land in Krian lying idle, accounts also, in all probability, for the poor harvests over the whole of the irrigated area in so-called bad years. Now that the cause is known it will be easy to suggest remedies, which can be applied at a comparatively small cost. For the most part all that is necessary is care and adequate supervision, but money will have to be spent in making and enlarging drains and watergates, and in building banks to separate areas of different elevations. Owners of poor land will be required to help a little by tilling and manuring the sites of their nurseries so as to raise seedlings of a taller growth.

Effect of Improved Irrigation on Total Crop.

When the simple measures suggested above are effected every acre of irrigated land in Krian will come into cultivation, and it will be possible in every part to obtain the maximum crop which the land is capable of yielding. A few figures will show the magnitude of the increase which may be expected.

Out of a total of 70,000 acres of irrigable land, 50,000 acres were planted last year. The area under cultivation can therefore be enlarged by 20,000 acres.

Then as regards the possible crop. While there are many thousands of acres which will yield between 500 and 750 *gantangs* of padi an acre, there is comparatively little land which will produce less than 300 if it is properly irrigated. It is estimating very moderately, therefore, to say that the crop for the whole district could be raised from 278 *gantangs* an acre, the average for the past three years, to a steady average of 350 *gantangs* an acre. At this rate of production, over the enlarged area which will soon be under padi, the total crop from Krian would amount to 24½ million *gantangs*. This is more than twice the amount obtained in 1912, namely 11¼ million

gantangs, and nearly 80% in excess of the average crop for the last three years, namely $13\frac{3}{4}$ million *gantangs*.

This increase is truly enormous when it is considered how simple and inexpensive are the means by which it can be brought about. Not the least satisfactory feature of the case is that the necessary measures are such as can be carried out by Government, and that the achievement of the result does not depend on the exertions of the Malays.

Soil Improvement.

All the land within the irrigated area in Krian is sufficiently fertile to ensure a living to its occupiers. But in the case of land yielding between 200 and 300 *gantangs* an acre the margin of profit is very slender, and efforts are being made to find a cheap method of improving the soil. The experiments have been described in a previous number of the *Agricultural Bulletin*. They are of two kinds, designed to test respectively the effect of cultivation and of manures. A full account of the results would be too long for publication in this article, and it will be sufficient to mention their salient features.

It has been found that shallow cultivation, either with the *changkol* or with the plough, has very little effect in the first year, but when repeated for two years it increases the crop by nearly 50%. Cultivation, therefore, is strongly to be recommended. The great difficulty is that the owners of this land are all too poor to buy ploughs and cattle. A method of inducing them to cultivate with the *changkol* which promises success is, however, described below.

The application of artifical manures has an immediate effect, but in no case was the value of the extra padi obtained equal to the cost of the fertilisers. There are, however, other manures in plenty which are obtainable at the expense of a little labour, and it is proposed to encourage the use of these. Indeed, it would be unwise to introduce the use of fertilisers into the district until the Malay has been taught to make the fullest possible use of the materials at his disposal.

The chief of these are weeds, padi straw and chaff, and farmyard manure. Immense quantities are now wasted yearly, because the Malays, with very few exceptions, are ignorant of their value. If this waste were prevented, as most of it easily could be, it would go far to check the impoverishment of the soil by the continuous raising of crops; and the plentiful use of the substances mentioned on the poorer land would result in a considerable increase in fertility.

Vegetable-Growing on Padi Land.

Experiments intended to teach the Malays how to utilise their land between the padi seasons were started immediately after the harvest last February. What was wanted was a crop which would

ripen in four months or less, would grow in any kind of soil, and would command a ready sale locally. The vegetables grown by Chinese market-gardeners were found to offer a fair choice, and the most suitable seemed to be the sweet potato (*ubi kalêdek*). It is a crop to which the Malays are quite unaccustomed, but they did not take unkindly to the idea, and plots, each about a quarter of an acre in size, were planted in ten different fields. Most of the men did the necessary work themselves, but a few of them hired Tamils to prepare the plots.

The crop, in point of profitableness, far exceeded expectations. In no case was the return less than $35 an acre, and on better soil it was as much as $50. How this compares with the return from padi may be judged by the following figures, which give two examples where the preparation of the vegetable plots was done by Tamils. It will be seen that on the poor land it is scarcely possible to make a profit from padi unless the owner of the field does practically all the work himself. The figures for the two crops are strictly comparable; in neither case do they include the cost of weeding or harvesting.

SWEET POTATOES.

Place.	Yield in pikuls.	Cost per acre.	Return.	Profit per acre.
Simpang Tiga	42	$14.11	$35.28	$21.17
Siakap	56	$18.75	$44.80	$26.05

PADI.

Place.	Yield in *gantangs*.	Cost per acre.	Return.	Profit per acre.
Simpang Tiga	200	$15.00	$16 00	$ 1 00
Siakap	350	$15.00	$28.00	$13.00

Mention was made above of the fact that the poverty of the owners of inferior padi land prevents them from buying ploughs and cattle with which to cultivate their fields. The profits to be made by vegetable-growing should supply the needful incentive to cultivate by more laborious means. As the necessary tillage is very thorough it would have an excellent effect on the soil, and, later, on the yield of padi. Moreover, the residue of the crop is all buried, and would serve as a green manure. Another point which should appeal to the Malays is that after the crop is lifted the land is left clean ready to be planted up with padi, and there would thus be a saving of many dollars an acre, or of the hardest work of the whole year. A potential advantage is that, according to authorities in the Philippines, locusts have little liking for the leaves of the sweet potato.

The benefits are so manifold that it should be an easy matter to induce the Malays to take up the cultivation. There is a big and steady demand for sweet potatoes, which is now supplied entirely by

Chinese who are allowed to cultivate between the rows of young rubber on estates in Krian and the Province. As the trees grow in size these men are being turned out, and it is difficult to see where they will get more land. The present, therefore, is an exceedingly favourable time for the Malays to get into the market.

NOTES ON TAPPING EXPERIMENT AT GUNONG ANGSI.

Second Year Result.

BY F. G. SPRING.

An account of this experiment was published in the *Agricultural Bulletin*, Vol. 1, page 154, and the results for the first year then given. It may be remembered that for the purpose of comparison the experiments in fields 1 and 3 are the same. This serves a double purpose. In the first place it shows the differences in yields of rubber obtained with similar systems of tapping at different elevations and secondly, the differences in yields of rubber obtained with varying systems of tapping at the same elevation. The labour employed is Tamil, one coolie being in charge of one experiment in one clearing, namely 80 trees. The gouge knife was used throughout.

It will be seen that in experiments 1 and 3 where tapping is conducted every day, the whole circumference of bark is completely tapped in 2 years while in experiments 2 and 4 alternate day tapping, the time allowed for bark renewal is 4 years.

The following is the results of total rubber obtained for the first year tapping. For monthly yields, see *Agri. Bull.*, Vol. 1, page 154.

		Expt. 1.		Expt. 2.		Expt. 3		Expt. 4.			
	Elevation.	Total Rubber.		Total Rubber.		Total Rubber.		Total Rubber.		Grand Total.	
		lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
1st Clearing	300 ft.	555	11	303	13	441	14	237	4	1,538	10
3rd Clearing	1,000 ft.	388	14	207	12	308	15	195	6	1,100	15

In the first year tapping, both at the first and third clearings, the adjacent quarters (double V) gave a considerably larger yield of total rubber than opposite quarters. During the period referred to above, the total excess of rubber from adjacent quarters compared with opposite, in fields (1) and (3) where two years are allowed for bark enewal, experiments 1 and 3, was approximately 25 per cent. while in the plots where the period of renewal is 4 years, experiments 2 and 4, the excess was approximately 17 per cent.

During the second year, in the first clearing, the yields of total rubber in adjacent quarters exceed that of opposite quarters, particularly where the period of bark renewal is 4 years, the difference being 120 lbs., in the plots where two years are allowed the excess in favour of adjacent quarters is 11 lbs., but an allowance of 25 lbs. of rubber has to be added for trees destroyed by wind in the latter part of the first year tapping, the total excess, therefore, is not 11 lbs. but 36 lbs. These differences are considerable when it is remembered that the number of trees in each plot is 80.

In the third clearing unfortunately a number of trees in adjacent quarters were destroyed by white ants, deer, and heavy gales. The trees lost in this clearing are as follows :—

Experiment 1 three trees, Experiment 2 six trees. Making allowance for these trees the excess of total rubber in adjacent quarters over opposite, 4 year bark renewal, is 15 lbs. but in the case of 2 year renewal there is a loss of 33 lbs.

Both at the first and third clearings it is seen that the excess of total rubber in adjacent quarters is most evident in the plots where the bark renewal period is 4 years. Apart from adjacent quarters giving more total rubber than opposite both at Gunong Angsi and Kuala Lumpur Experimental Plantations, the first mentioned is a very much cheaper system to adopt as regards cost of tapping, latex cups and the clearing of same, holders, spouts, collecting latex, and the marking out of the guiding lines.

The next point of interest is a comparison of the same system of tapping where 2 and 4 years are the periods of bark renewal. These comparisons are given underneath.

Double V, Bark Renewal,	2	years,	1st	clearing.	683	lbs.	12	ozs.
,, V, ,,	4	,,	1st	,,	598	,,	8	,,
			difference		85	,,	4	,,
,, V, ,,	2	,,	3rd	,,	435	,,	11½	,,
,, V, ,,	4	,,	3rd	,,	315	,,	5¼	,,
			difference		120	,,	6¼	,,
Opposite Quarters	2	,,	1st	,,	672	,	1¾	,,
,, ,,	4	,,	1st	,,	478	,,	11¼	,,
			difference		193	,,	6½	,,
,, ,,	2	,,	3rd	,,	480	,,	11½	,,
,, ,,	4	,,	3rd	,,	324	,,	15¼	,,
			difference		155	,,	11¼	,,

At the close of the second year tapping, experiments 1 and 3, both at the 1st and 3rd clearings, the whole circumference of bark has been completely removed in 2 years and it is now necessary to tap on two year renewal of bark or commence top tapping, both of which are most unsatisfactory, the first as regards thinness of bark and the second as regards yield of rubber, the alternative being to

rest the trees. Compare this with experiments 2 and 4. At the close of the 2nd year only half the circumference of bark has been removed and there remains untapped bark for the 3rd and 4th year. In the first few months of tapping in 1911 the quantity of latex obtained has been directly dependent on the amount of bark removel but at the end of one year the difference is not so great, while during the second year the differences are comparatively low and by no means in proportion to the amount of bark removed. In the 3rd and 4th year the yield of latex in experiments 2 and 4 (four year bark renewal) will in all probability exceed that in which the bark is removed at double the rate on account of top tapping which is to be conducted It is fairly clear that to remove the whole circumference in two years is expensive as regards labour and unsatisfactory in yield of rubber.

The next point of interest is the yield of total rubber, with similar systems of tapping but at different elevations. These results for the second year are as follows.

		Expt. 1.		Expt. 2.		Expt. 3.		Expt. 4.			
	Elevation.	T. Rubber.		T. Rubber.		T. Rubber.		T. Rubber.		Grand Total.	
		lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
1st Clearing	300 ft.	683	12	598	8	672	1¾	478	11¼	2,433	1
3rd Clearing	1,000 ft.	435	11½	315	5¼	480	11½	324	11¼	1,556	7½

It should be noted here that in the previous article the distance of planting was given as 20 × 20 ft. This is not the distance of planting in the first and third clearings. The distance of planting in clearing number three is 15 × 15 ft. and in number one 25 × 23 ft. This factor has to be considered along with elevation as regards yield of rubber at different elevations with similar systems of tapping but does not affect the individual experiments at the same elevation.

The increases in average girth measurements at an elevation of 300 ft. are 8·0, 9·3, 9·7, and 8·7 inches or an average of 8.9 inches, while the increases at an elevation of 1,000 ft. are 7·38, 8·4, 6·0, and 7·2 or an average of 7·2 inches.

These figures also show that in the case of adjacent quarters the excess of average girth increase over opposite quarters is considerable where the period of bark renewal is 4 years, this is consistent with the higher yield of total rubber in adjacent quarters over opposite where 4 years are allowed for bark renewal.

The following is a list of the experiments.

Experiment 1.

System of tapping—Double V, cuts 18 inches apart.
Twenty cuts to the inch. Every day tapping.
Time allowed for bark renewal, 2 years.

No. of trees 1st clearing 80, average girth in 1911, 26·3 inches, elevation 300 ft.
„ Oct., 1913, 34·3 inches.
No of trees 3rd clearing 80, „ in 1911, 21·12 inches, elevation 1,000 ft.
„ Oct., 1913, 28·5 inches.

Experiment 2.

System of tapping—Double V, cuts 18 inches apart.
Twenty cuts to the inch. Alternate day tapping.
Time allowed for bark renewal, 4 years.

No. of trees 1st clearing 80, average girth in 1911, 25·6 inches, elevation 300 ft.
„ Oct., 1913, 34·9 inches.
No. of trees 3rd clearing 80, „ in 1911, 21·4 inches, elevation 1,000 ft.
„ Oct., 1913, 29·8 inches.

Experiment 3.

System of tapping—Opposite quarters. Two cuts 18 inches apart on each quarter.

Twenty cuts to the inch. Every day tapping.
Time allowed for bark renewal, 2 years.

No. of trees 1st clearing 80, average girth in 1911, 25·1 inches, elevation 300 ft.
„ Oct., 1913, 34·87 inches.
No. of trees 3rd clearing 80, „ in 1911, 21·9 inches, elevation 1,000 ft.
„ Oct., 1913, 27·90 inches.

Experiment 4.

System of tapping—Opposite quarters. Two cuts 18 inches apart on each quarter

Twenty cuts to the inch. Alternate day tapping.
Time allowed for bark renewal, 4 years.

No. of trees 1st clearing 80, average girth in 1911, 25·8 inches, elevation 300 ft.
„ Oct., 1913, 34·5 inches.
No. of trees 3rd clearing 80, „ in 1911, 21·7 inches, elevation 1,000 ft.
„ Oct., 1913, 28·9 inches.

Second Year Result.

EXPERIMENT 1

Latex Rubber

Month	1st Clearing		3rd Clearing	
	lbs.	ozs.	lbs.	ozs
27-31 August, 1912	4	3½	3	3½
September ,,	39	9	38	10½
October ,,	31	7¾	29	3
November ,,	39	2¼	25	3½
December ,,	45	8¾	40	2¾
January, 1913	59	13	35	8
February ,,	46	13	23	7¾
March ,,	55	1¼	30	7
April ,,	51	3	23	4½
May ,,	59	11¼	33	5
June ,,	63	5½	26	9
July ,,	58	14¼	38	3
1-26 August ,,	51	3¼	27	3¼
Total	606	0	374	6¾
Total Scrap and Bark Shavings	77	12	61	4¾
Total Rubber	683	12	435	11½

EXPERIMENT 2

Latex Rubber

Month	1st Clearing		3rd Clearing	
	lbs.	ozs.	lbs.	ozs.
27-31 August, 1912	7	0	2	7½
September ,,	36	13¼	21	3¼
October ,,	38	12	25	9¼
November ,,	27	1¾	17	2¼
December ,,	44	3¼	29	2¼
January, 1913	45	9¼	26	5¼
February ,,	37	5¼	23	3
March ,,	41	0½	24	12¾
April ,,	49	8¼	20	8¼
May ,,	53	12	15	9½
June ,,	59	14	17	15¾
July ,,	56	7½	23	10½
1-26 August ,,	45	5¼	23	6½
Total	542	12¼	271	0
Total Scrap and Bark Shavings	55	11¾	44	5¼
Total Rubber	598	8	315	5¼

Second Year Result.

EXPERIMENT 3

Latex Rubber

Month	1st Clearing		3rd Clearing	
	lbs.	ozs.	lbs.	ozs.
27-31 August, 1912	2	0¾	4	15¾
September ,,	32	6	32	6¼
October ,,	39	0	29	14¼
November ,,	33	4¼	28	1½
December ,,	53	6¼	38	9½
January, 1913	63	9¾	37	4¾
February ,,	52	9½	36	1¼
March ,,	48	7½	39	14¾
April ,,	51	9	33	6¾
May ,,	57	5¾	38	1¼
June ,,	56	15¼	32	12¼
July ,,	55	0¾	37	0
1-26 August ,,	45	2¼	27	8¼
Total	590	13	416	0½
Total Scrap and Bark Shavings	81	4¾	64	11
Total Rubber	672	1¾	480	11½

EXPERIMENT 4

Latex Rubber

Month	1st Clearing		3rd Clearing	
	lbs.	ozs.	lbs.	ozs.
27-31 August, 1912	3	12	4	5½
September ,,	29	5½	23	4½
October ,,	32	2¾	28	10½
November ,,	24	3	20	6
December ,,	42	3¼	31	14¼
January, 1913	51	3¾	23	12¾
February ,,	30	8¼	24	5
March ,,	31	7½	27	4½
April ,,	32	2¼	26	2
May ,,	36	15¼	18	0¾
June ,,	29	8½	15	9½
July ,,	42	1¼	22	13¼
1-26 August ,,	32	6¼	16	2
Total	418	0	282	10½
Total Scrap and Bark Shavings.	60	11¼	42	4¾
Total Rubber	478	11¼	324	15¼

LOCUST WORK IN SELANGOR.

BY F. DE LA MARE NORRIS.

PROGRESS REPORT FOR OCTOBER.

Throughout the month of October locusts in the hopping stage were still numerous in Selangor, and their destruction was supervised by the Special Assistants in their respective districts.

In the neighbourhood of Kajang the swarms were comparatively small and scattered, and by October 20th, the district was practically free from hoppers, and it seemed advisable for the officer in charge of the work to return to his own State, Negri Sembilan, as his services were urgently required there. During the month approximately 465 tins of locusts, representing about 110 swarms, were destroyed in the district. The swarms around Kuala Lumpur were, on the contrary, large and the apparatus available was barely sufficient to cope with them. Moreover, they did not confine their attention to waste land or lalang, but did a considerable amount of temporary damage to gardens and hedges, and the scarcity of apparatus made it quite impossible either to deal with some of the smaller swarms or to distribute any sheeting to protect gardens and tennis lawns from their ravages. The chief centres of work were the Circular and Ampang roads and the Petaling district, and in both of these localities two gangs of coolies were employed. By October 28th there were few hoppers in the vicinity, and no further destruction was possible. The catch for the month was 1,820 tins, representing 83 swarms in all. In the Ulu Selangor district, swarms were large and in situations where they were difficult to deal with, but the results were most satisfactory and the locusts in this neighbourhood have received a check which cannot have failed materially to decrease the possibility of their threatened advance into Perak. The chief centres of work were Rasa, Batang Kali, Bukit Chondong, the Kuala Selangor road, and Serendah. By the end of the month the work was finished. The catch was 3,030 tins, 50 swarms being accounted for. In addition to the work done by the Special Assistant and the Government coolies the Malays caught approximately 12,000 tins of hoppers for the reward of 50 cts. per tin, in this district.

SUMMARY OF WORK FOR PERIOD AUGUST 6th TO OCTOBER 31st AND PRESENT POSITION.

The period from August 6th to October 31st may conveniently be termed the "hopper season" in Selangor and fortunately it corresponded approximately with the occurrence of flying swarms in Negri Sembilan. This made it possible to concentrate the majority

of the apparatus in Selangor and to obtain the services of one of the Special Assistants from that State. At the commencement of the period apparatus was scarce and this has been a handicap throughout, though towards the end of the season the position has greatly improved.

With the termination of the hopper season, it would appear to the casual observer, that work has ceased; but in reality this is not the case, and the present time is by no means a period of rest for those in charge of the work. The coolie gangs have been dispensed with, but the officers and conductors have all their time fully taken up. One Special Assistant has been lent to Negri Sembilan, and is helping to cope with the hoppers there; the other officer is now busy preparing for the next season. Conductors have been posted in every district with instructions to locate and trace the movements of the flying swarms throughout the State, with the result that we are now acquainted with the positions of forty-four swarms. Of these only six are large; fifteen are medium and twenty-three quite small. The largest swarm is at present in the neighbourhood of Ulu Klang and probably consists of the locusts that escaped from the Ampang and Setapak districts. Many of these swarms are fairly stationary, nearly all the moving ones are travelling in an easterly direction, some having gone far into the jungle.

The locating of these swarms is of the greatest importance to the successful working of the scheme, and our position at present is undoubtedly far more favourable than it was at the commencement of the last hopper season, as there will be now no need to wait for reports of breeding grounds and hoppers. By watching the movements of the swarms we shall at once know when they are about to breed, and it will be possible to prevent many of them from ever giving rise to another generation. The difficulty with regard to apparatus has been overcome, a large consignment having recently arrived in the country.

Appended is a summary of results obtained during the hopper season in Selangor.

Summary of results in Selangor for the period August 6th to October 31st.

DISTRICT.	LOCUSTS CAUGHT BY	KEROSENE TINS.	SWARMS.
Ulu Selangor	Special Assistant and Government Coolies.	4,347	72
do.	Malays, for 50 cents per tin.	14,100	28 (estimated)
Kuala Lumpur	Special Assistant and Government coolies.	5,768	149
Ulu Langat	Special Assistant and Government coolies.	538	143
	Total	24,753	392

ROTAN SEGA.

By L. C. Brown.

The Rotan or "Rotan Sega" is a valuable forest vine, indigenous to the Federated Malay States and is to be found growing in most districts.

The purpose for which it is mainly used is for the best fine rotan work, cane chairs, basket ware, etc., and on this account is always in very good demand while commanding the highest price of any rotan on the market.

It is essentially a forest vine, and in Malaya there are attached to many estates considerable forest reserves which at present serve no useful purpose, and in many cases there appears but little prospect of this "waste land" augmenting to any considerable extent the value of the cultivated part. Under these circumstances it seems that this class of land is suitable for growing such a product as the above Rotan and might be utilized for this purpose.

Many enquiries addressed to this office relating to the cultivation of this vine induced me, while on a recent tour of inspection on the Pahang River, to examine and enquire into the methods used in its "cultivation," and the possibility of its being of value to Europeans who might have land available.

As might be expected from the customary habit of the Malay to do all work with the least possible labour and with singular disregard of the ultimate results of his exertions, his system of "cultivating" this vine is very primitive. After the land has been acquired by the Malay the only preparation for planting made is to clear the undergrowth in the immediate vicinity of those trees at the base of which it is intended the vine should be planted. These trees are selected and range from 15-20 feet apart. For planting, two methods are used.

First:—Seed at stake. *Secondly*:—Young plants from a nursery. In both cases they are planted quite close to the trunk of the selected trees in order that the young shoots can immediately attach themselves to the trees. Of the two methods the latter is the more usual one adopted by the Malay. The seed is plentiful and easily procured. For transplanting, which appears to be the better way, a nursery is prepared and the seed sown in it. When of sufficient size the young vines are planted in the way already described and no further attention devoted to them until some of the vines are ready to collect. One plant, I understand, will produce 50 or more shoots which ultimately form the canes, each of which often obtains the length of 100 feet.

At first the Rotan is covered with sharp pointed thorns, but as the vine matures these, together with the outer covering, are shed and when ready to be cut there remains only a smooth surface.

There is a slight difference of opinion on the length of time it takes from the planting of the seed to the time the vine is mature, but from the enquiries made it would seem that a few are ready to cut after 6 years, and in each succeeding year a few more until an average yield may be expected. The vines, however, are not necessarily cut every year, for in one of the "plantations" I visited the owner said he collected them once in two years and to do this it was necessary to make rentices through the dense undergrowth which had sprung up in the time intervening between each gathering of the crop. When allowed to grow wild for two years it is not possible without these rentices to obtain the vines, or to haul the product from the forest.

It will be seen that the Malays take practically no trouble in the cultivation of the product in question, and I feel sure that under more favourable conditions the plants might be made to yield a great deal better than is at present the case and at no great expense. For instance, with more light thrown upon the vines they would probably mature at a much earlier age. With the Malay method of growing this vine the plants when young are overgrown with heavy undergrowth, and it would require but small attention to remedy this, thus improving the prospect of the vines making better progress, and ultimately giving a better result.

With very little care and small expenditure, the systematic cultivation of this product would possibly prove a good agricultural investment and is certainly worth a trial by Europeans.

MESUA FERREA, CEYLON IRON WOOD, AS A POSSIBLE SUBSTITUTE FOR LIGNUM VITAE IN TIN MINING MACHINERY.

It has been suggested that this timber might replace Lignum Vitae in tin-mining machinery, and to test this theory, Mr. Smith of Tekka Mines, near Taiping, kindly conducted experiments. The timber supplied was that from a tree grown in the Residency grounds, Taiping, which, owing to its close proximity with another of the same species, was cut down in March of this year and stored in a dry shed till July, when the bole and larger branches were handed over for experiments. The size of the bole in circumference, at three feet above ground, was forty seven inches and the age about twenty years.

The following report tends to show that timber from a tree at twenty years old, cannot replace "Lignum-Vitae."

Tekka Mines, Taiping.
October 24th, 1913.

RE IRON WOOD OF CEYLON.

We received a quantity of this timber for experimental purposes as a possible substitute for "Lignum Vitae," a wood largely used in machinery owing to its excellent properties under stress and friction, also its natural self-lubrication when used in bearings which work under water, and which are always difficult to lubricate by outside means.

After trial we have found that Iron wood *does not* contain this most valuable property of self-lubrication, therefore making it unsuitable for bearings or moving parts under friction, its degree of hardness also does not compare favourably with "Lignum Vitae" not being so close grained.

Iron wood would probably be quite suitable for purposes of construction work where submerged, as it is impervious to water, and would make excellent piling.

It was found a difficult timber to work due to cracking and splitting, radial from the heart of bole. This was at first thought to be due to its not being seasoned, a portion of the bole was afterwards stored in a dry place for three months with the same results, it being found impossible to obtain a good section free from cracks when cut.

As a result of the trial we gave this wood, it will be seen that we cannot hold any high opinion of its especial use for the demands of Engineering work.

SD: E. H. SMITH,
Engineer.

The genus Mesua (N. O. Guttiferae) comprises about half a dozen species of ornamental trees and shrubs, natives of Tropical Asia, of which *M. ferrea* is the most useful and most ornamental. It is known in the vernacular as Penaga Kunyit, also Penaga lilin, Penaga puteh, or Penaga suga, and in Tamil as Naka or Nangul. The generic name Mesua, is derived from that of two celebrated Arabian physicians and Botanists, "Mesue," who flourished at Damascus in the eight and ninth centuries. The species *ferrea* is a slow growing moderate sized tree about forty feet high, broadly conical, densely branched, the lower branches almost touching the ground, native of Southern India, Ceylon and Malaya. Heartwood dark red and extremely hard, medullary rays very fine. The young leaves which appear twice yearly, are at first brilliant red, then pink, gradually passing to dark green of the adult stage. Mature leaves, from two to six inches long, deep green and shining on the upper surface, underside

covered with a greyish white powder, lancolate or lanceshaped and coriaceous or leathery. Its flowers, very like the English dog rose, are white, very fragrant, three to four inches in diameter, solitary. Stamens deep yellow, contrasting extremely well with the white corolla. Fruits pointed, two-valved, supported by the persistent scaly sepals, containing one to four hard-skinned shining seeds, yielding oil.

As an ornamental tree both for its beautiful flowers and foliage, it is difficult to find a more handsome one, its perfect shape and habit make it an excellent subject for planting as a specimen tree on lawns or at the entrance of carriage drives.

W. L. WOOD.

Superintendent, Hill Gardens, Perak.

REVIEWS.

The preparation of Plantation Para Rubber by S. Morgan:—

This book, written by the Local Research Chemist of the R. G. A., is certainly one of the best books on rubber published during recent years. The title sufficiently indicates the contents, although the author is dealing entirely with plantation "Para" rubber which, at any rate, constitutes by far the greater proportion of plantation rubber.

Chapter I contains a brief discussion on planting and methods of thinning out and does not contain any new information.

The second chapter deals with the vexed question of tapping systems and consists to a great extent of remarks and criticism on the various systems in vogue, in addition to which interesting tapping experiments carried out by the author are given. These experiments lead to the same conclusions as were derived from somewhat similar experiments carried out during the last 3 or 4 years at the Agricultural Department viz., that excessive tapping reduces both the volume of latex and the rubber content of the latex and that, per tapping, an alternate day method yields more rubber. This would also mean a reduction in the cost of tapping. Too many questions are involved to enable one to recommend alternate day tapping definitely. Incidentally, it may be mentioned that the vulcanisation tests carried out on samples obtained in these tapping experiments, appear to have indicated for the first time the superiority of smoked sheet.

In connection with the carrying out of tapping experiments it would appear that much time has been wasted in the past, even by scientific workers, by unfortunate selection of trees, or by carrying out experiments on too small a scale, or without adequate controls, so that the deductions to be drawn from these expreiments lose much of their value. *Again, one is afraid to place too much reliance on* many of the results obtained especially in tapping experiments, unless one knows that the experiments have been personally supervised by the experimenter from beginning to end, as I have found myself the most extraordinary measurements made by native assistants even after considerable training.

Another point which is often lost sight of, even by the scientifically trained agriculturist, although this should not be so, is the percentage error involved. So many factors are concerned in agricultural operations, that unless one knows the limits of error or variability in an experiment, the result may be valueless. As an illustration, in connection with manurial experiments, it may be found that by the application of a certain fertilizer to a crop, an increase of 10 per cent in the yield is obtained. The next question to be considered, is whether this difference of 10 per cent, or any part of it, is merely a natural variability due to a number of factors, or is caused by the application of the fertilizer. This can only be ascertained by experimenting in a similar manner on a number of plots suitably chosen, and carrying on the experiment for a prolonged period or for several successive crops. In this way only can the natural variation or error be ascertained. Another fault often observed, is that experimenters, even those again who ought to know better, vary more than one factor at a time in an experiment.

These facts need special emphasis in connection with tapping experiments, as it is well known that individual trees vary considerably in yield of both latex and dry rubber.

The criticisms which the author of the book under review finds it necessary to give in this section, fully bear out the remarks expressed above. By this time we ought to be in possession of reliable statistics and information as to the best methods of tapping to adopt, always bearing in mind the financial considerations involved.

I have dilated somewhat lengthily on this chapter, because these points cannot be too strongly emphasised and feel that much valuable time has been wasted in the past.

The next section on "Tapping and collecting" deals in a very comprehensive manner with the question of tapping instruments, and collecting cups and contains valuable hints on a number of points, which should be, but are often not realised by the planter. Incidentally the author, while deprecating top tapping for several

reasons, which are well known, states that vulcanising tests have not shown any inferiority in the rubber obtained, from ordinary top tapping, at about 9 or 10 feet, to that obtained from normal tapping nearer the base, although the rubber obtained from the leaves of the tree, as can be seen in the case of the raw material, is inferior.

In the next section dealing with the transport of latex, it is interesting to note that formalin has no deleterious action on rubber, and this substance should find increasing use for the prevention of natural coagulation in the field and the prevention or diminution of the various chromogenic micro-organisms which attack the freshly prepared raw rubber, as experiments carried out in the Agricultural Department show that rubber prepared from latex to which formalin has been added, is not so liable to develop fungoid growths, during the initial stages of drying, when most of the damage takes place. The use of Sodium sulphite as an anti-coagulant, which has been recommended by Mr. Barrowcliff of the Agricultural Department, is also recommended in this section and shown to have no deleterious effect on the rubber produced.

Under "General field operations" valuable suggestions are again given in connection with small but important details of procedure.

Part II of the book deals with factory operations and deals thoroughly with practically all the problems met with in the factory, such as dilution of latex, coagulant, dilution of coagulant, bulking of latex, straining, addition of acid, oxidation of rubber causing darkening, the use of sodium bisulphite to inhibit oxidation, use of formalin etc. Chapter VIII treats of the preparation of sheet rubber and enumerates the various defects observed, gives remedies for these or means of obviating them. Chapter IX discusses Crepe rubber in a similar fashion and the various methods adopted to procure light colour by destroying the oxidising enzymes.

In this section it is pleasing to note the author's recommendation of a washing machine on the Werner-Pfliederer Universal Washer system, since this confirms the reviewer's conclusions in a recent report, derived from inspections of factories in Europe and methods of washing adopted therein for low grade rubbers.

Systems and methods of drying are fully discussed in the next section. Smoking is also discussed under this section.

The value of the information given, consists in the fact that all the conclusions arrived at are supported by vulcanising tests and these conclusions agree with opinions expressed by the reviewer, which had not the moral support of such tests. The vulcanising tests also appear to support the conclusions deduced from viscosity

tests on raw rubber and indicate that this test, under proper control, may be a valuable one for a particular species of rubber such as Hevea. It is a pity, I think, that no viscosity experiments are given in the book, as it would have been interesting to compare the results obtained with the mechanical tests carried out on the same samples after vulcanisation.

Part III deals with machinery and buildings and the same amount of common sense and appreciation of various factors which are often overlooked, is brought to bear on the numerous problems which present themselves in this connection, as in the other details of manufacture mentioned previously.

One interesting observation, which has never come under the writer's notice, is the actual occurrence of small particles of brass etc. in the rubber from the bearings of a machine. The author confirms the remarks previously given elsewhere as to the danger of using copper rollers, due to the formation of copper salts and their injurious action on rubber. The various minor though important defects in certain machines, sometimes common to all, are also pointed out in this section.

Chapters XIV and XV deal in greater detail with the defects of crepe, block and sheet rubber and discusses remedies and prophylactic measures.

Interesting tests shewing the comparative strengths of different samples are given in the next section and the advantages of preparing smoked sheet compared with crepe are enumerated in a very lucid manner, and expressed, in what should be to planters or owners the most interesting mathematical method—dollars, or pounds, shillings and pence.

A section devoted to a discussion of the respective merits of Plantation and Fine Hard Para is also of interest, especially since the statements made and conclusions arrived at are supported in every instance by mechanical tests carried out on vulcanised specimens, which must be the only criterion.

It will be very satisfactory if, with the plant at the Agricultural Department we shall be able to verify all the results arrived at.

In the subseuequt section on "Choice of Coagulant" the author supports the results obtained by the reviewer in contradiction to those arrived at by Parkin in Ceylon.

Although it is shewn in this section that other mineral and organic acids are equally effective as Acetic acid as a coagulant, their use is not recommended at present, for various reasons which are discussed, and the use of acetic acid is recommended.

The fallacy of the arguments of those who abuse plantation rubber on account of the fact that "chemicals" viz. Acetic acid

are used in its preparation, are pointed out in the succeeding section, where it is shewn, as would be expected, that the residual acidity of plantation rubber is considerably lower than that of Fine Hard Para, in which the acid is a natural constituent of the fumes produced by the slow combustion of the fuel used. Interesting suggestions are also made re grading, and general information given on the subject of spraying mixture for various fungoid and insect pests.

The final chapter contains general information on cultivation of soils and as it contains nothing new, calls for no remarks.

The only real criticism which can be given, is that possibly the book might have been somewhat more condensed, as the information is redundant in parts—due principally to the method of division adopted. This redundancy however serves to emphasise various points. The marginal remarks are of considerable value in enabling one to refer easily to any particular point.

The book is eminently practical and should be in the hands of every planter—manager or assistant, and I might suggest in addition—factory engineers and designers of rubber factories.

Rubber and Rubber Planting by R. H. Lock:—

This book has been written recently by Dr. Lock formerly Assistant Director, Royal Botanic Gardens, Ceylon.

I regret that such favourable remarks cannot be applied to this volume as to the book reviewed above. One would have anticipated quite a different book from the hands of an authority such as Dr. Lock.

As it stands, no doubt the book may be of value to some readers, but this will be the reader at home, who has never seen a rubber tree, and certainly not the practical planter, for the book contains none of these valuable suggestions on the numerous problems which confront both the planter and the scientific adviser, which are contained in the publication reviewed above.

After such books as "Hevea brasiliensis or Para Rubber" by Herbert Wright, "Rubber" by Schridowitz and the small volume "Rubber" by Clayton Beadle and Stevens, the present publication is unnecessary, as it contains nothing that is new. The illustrations are by no means well chosen, the only washing machine given being a hand machine, while in connection with the problem of drying it would have been much more interesting to have given a drawing or photograph of a drying or smoke room than of a vacuum drier, since the latter method of drying is much less common.

On the problem of preparing a light coloured crepe rubber, Dr. Lock mentions only the method of immersion in water at 80° C., and does not refer at all to the most recent and satisfactory method

of using Sodium bisulphite. The book is probably intended for the home reader and cannot be recommended to planters, as the books quoted above are much more suitable.

B. J. E.

THE HOUSE-FLY AS A DANGER TO HEALTH.

Under the above heading Mr. E. E. Austen publishes in the Economic Series of the British Museum a most interesting paper, and the information contained in it will be of value to residents of this country. With the exception of the description of the house-fly (Musca domestica) most of this paper is quoted.

As a general rule accumulations of fermenting horse-manure form the chief breeding-places of the house-fly, but although this insect lays its eggs by preference in horse-manure, it will also breed in other excrementitious substances, and in decaying and fermenting organic matter of various kinds, such as is often present in ashpits and larger deposits of house-refuse. The dull, chalky-white eggs are about $\frac{1}{25}$th to $\frac{1}{20}$th of an inch in length, and are laid in small masses generally in crevices in the material that is to supply the maggots (or larvae) with food. A single female house-fly lays from 120 to 150 eggs at one time, and may deposit five or six such batches of eggs during its life. The rate of development varies greatly, depending upon several factors such as the temperature of the food-material and of the air, and the character of the food. In the British Islands, however, it has been found that in very hot weather the progeny of a house-fly may be laying eggs about three weeks after the eggs from which they themselves developed were deposited. The eggs hatch into white, footless maggots which when full-grown are a little under half an inch in length ; the chrysalis or pupal stage is passed within a dark reddish-brown, barrel-shaped puparium or shell from which the fly emerges by splitting off a cap at one end.

In winter the persistence of the species is apparently secured by the survival, in bake-houses, kitchens, stables and other suitable retreats, of flies which are the parents of the earliest broods of the following season. In the British Islands these latter usually commence to make their appearance in June, though as a rule it is not until the following month that the numbers of flies begin to show a marked increase. Generally speaking, in the absence of local conditions specially favourable to the breeding of the insects in abnormal numbers at an earlier period than usual (as at Post wick, near Norwich, in June July, 1910), house-flies in the United Kingdom are most numerous in the months of August and September but they are often still common in October, and sometimes even

in November. The occasional local occurrence of house-flies in such numbers as to constitute a veritable "plague" is generally traceable to one or more of the following factors:—(1) Exceptional meteorological conditions favouring abnormally rapid development (2) the local abundance of breeding places and of food-supplies for the maggots or larvae; (3) the presence, in the immediate vicinity, of a "tip" or dumping-ground for dust-bin refuse, on which, with the refuse, are continually being deposited large numbers of larvae and pupae, which have developed from eggs originally laid in a number of different centres.

Large numbers of house-flies are destroyed every autumn by a parasitic fungus (*Empusa muscae*, Cohn), which is the most effective natural enemy of *Musca domestica*; flies killed in this way may often be seen clinging to window panes and walls, attached to the supporting surface by outgrowths (rhizoids) from the fungus itself.

Since the house-fly breeds, as we have seen, in dung-hills and refuse heaps, and during its adult life alights and feeds indiscriminately upon human excreta as well as upon human food, it is obvious that grave results may ensue when house-flies and certain forms of disease exist together. Much has been written in recent years with reference to house-flies and the spreading of various human diseases of bacterial origin, and, although the experimental evidence is as yet incomplete, there can be no doubt that, under certain conditions, these insects act as carriers of cholera, typhoid fever, and tropical dysentery, while in connection with other maladies, such as infantile or summer diarrhoea, the house-fly at present rests under grave suspicion. Since this fly is incapable of biting, its action as a disease-carrier is contaminative, and therefore very different from that of an African tsetse-fly or a malaria-carrying mosquito, which is armed with a piercing proboscis. The germs of disease, if conveyed by a house-fly, are carried on the exterior of its legs, wings, head or body, or, as is more usually the case, in the insect's crop or intestine, and may subsequently be deposited on food or other substances. House-flies therefore become a serious menace to health when liable to contamination with disease-causing organisms, and should consequently be regarded as dangerous enemies, which should be destroyed and kept in check by every possible means.

The potentialities of the house-fly as a disease-disseminator in the poorer quarters of cities and in farmhouses and rural districts generally, quite apart from the annoyance and discomfort caused by its activities, especially when it is present in excessive numbers, render *Musca domestica* by far the most important of British insects from the standpoint of public hygiene. Under modern con-

ditions house-flies, except as "danger signals," serve no purpose useful to ourselves ; while, as just pointed out, they may at any time develope into a danger to human life, so that no one need have the slightest compunction in killing them. Obviously, however, it is of more importance to prevent house-flies from breeding, than, after allowing them to breed unchecked, to endeavour to kill the resultant broods when they have invaded houses.

Temporary accumulations of horse-manure should if possible be stored in fly-proof bins, while kitchen refuse should be deposited in completely closed receptacles, into which it should be impossible for flies to crawl. House-fly maggots, like many other Dipterous larvae, are tenacious of life, and although they can be killed, at any rate experimentally, by mixing with the manure or garbage in which they are feeding substances such as chloride of lime or sulphate of iron in solution, there are various practical difficulties in the way of such methods. In practice, therefore, the most important and effective means of preventing house-flies from breeding is the systematic removal, of all deposit of stable-manure and house-hold dustbin or ashpit refuse at least once a week. Since, as has recently been shown, house-flies are capable of flying to a distance of 1,700 yards, no municipal depot, contractor's dumping ground or "tip," where household refuse is allowed to remain for any length of time, should, if any other arrangement is possible, be established or permitted to exist within one mile and a half of the nearest habitations.

In military standing camps, where in hot or warm weather there is always a danger that house-flies may be bred in large numbers unless the methods of modern military sanitation be rigidly enforced, epidemics of typhoid fever may readily be caused owing to the joint presence of house-flies and human typhoid "carriers." Some form of incinerator should always be used for the destruction of stable-litter and other refuse, as well as of human excreta, which may contain the typhoid fever organism (*Bscillus typhosus*), and in the latrines, whether trenches or pails be employed, some system of flyproof covers should be adopted. If the provision of such covers be rejected as impracticable, it rests with the responsible authority to ensure that earth is not only provided in sufficient quantity, but used in such a way as to render it impossible for flies to become contaminated.

Of the various means of destroying house-flies in rooms, those commonly in use are too well known to require mention. Flies on the wing may readily be knocked down and killed by means of a kind of racquet of flexible wire gauze (known as a "fly-killer"), provided with a wooden handle, and obtainable from iron-mongers. The best ready-made fly-traps, other than ordinary fly-papers, are

probably the "balloons" constructed of wire gauze, and "tanglefoot" tapes or other contrivances coated with a sticky gum. Good results are said to have been obtained by the use of a dilution of formalin in water, in the proportion of a teaspoonful of formalin to a teacupful of water. To make it more attractive to flies, the dilution may be sweetened with sugar or mixed with milk, and a soup-plate or other shallow vessel should then be partially filled with the mixture in the evening, and allowed to stand through the night on a table in a room in which flies are troublesome. Provided that all other liquids from which the insects could drink have been removed or securely covered, the flies will sip the mixture in the early morning, and a little later may be swept up dead a short distance away. Formalin diluted to the extent mentioned is not dangerous to man, and this method may be used without hesitation even where food is exposed.

It is said that paraffin, if rubbed on the sashes and bars of the window, will kill all the flies in a room; this method at any rate possesses the merits of simplicity and cheapness.

So far as possible, human food—especially such substances as cooked meat and milk and sugar, which are especially attractive to these insects—should always be protected from flies by covers of wire-gauze or muslin, and house-flies should not be allowed to settle upon persons suffering from infectious or contagious diseases. Rigorous precautions should, of course, be taken to prevent house-flies from coming into contact with the sputa of consumptives, or with the evacuations from cases of cholera, typhoid fever, summer diarrhoea and other intestinal disorders. No system of sanitary control can be regarded as efficient, which allows flies to have access to material containing the germs of disease.

H. C. P.

KAJANG DISTRICT PLANTERS' ASSOCIATION.

Minutes of General Meeting held at Kajang 4 p.m., 7th November, 1913.

Present. C. Burn Murdoch (Chairman), D. C. P. Kindersley, T. S. Dumbreck, K. G. Furley, A. C. Hayton, C. G. Jeavons, P. K. Paul, A. A. Mulloy, P. Butler, G. F. Tyler, H. Gough, F. B. Kendall, G. D. F. Sinclair E. W. King, C. R. Ferrers, P. F. Wise, E. M. Schwabe, F. St. Barbe, E. W. Tyler, R. Drummond-Hay, C. P. Everard, H. R. Moullin, H. W. Rickeard, F. B. Gough.

Vistors. P. Trump, E. B. Skinner. Oliver, J. Mayer.

1. Before confirming the minutes of last meeting it was proposed by D. Kindersley and seconded by P. F. Wise that in the resolution re the Roads in the Kajang District the words "of some" be inserted between "of" and "the"—the resolution now reading

"that the attention of Government be brought to the very bad state of some of the roads" etc. With this alteration the minutes were passed.

2. Coolies, Wages.

The Chairman introducing the subject said—The question now before the meeting is the reduction of wages. This Association has already agreed to reduce Chinese and Javanese wages, and in the case of these classes of Labour the reductions, I believe, have already been made without any serious difficulty. The rates now ruling are Chinese 60 cts., Javanese 40 cts., and Malays 45 cts. These rates are the same as the rates recently passed by the Klang D. P. A. with the difference of 5 cts. to Malays.

The time has certainly come when the Tamil rates should be reduced, perhaps reduced is hardly the word, but brought back to something nearer the rates ruling before the boom. As pointed out by the Chairman of the Klang D. P. A. the Coolie now arrives free and yet his rates have gradually risen from 30 cts. to 40 cts., in many places.

At the recent meeting of the P. A. M. the question of reducing Tamil rates was brought up and it was then clearly recognised that for the reduction to be really effective, unanimity of the whole country was required, not only of Planters but of Miners and Government Departments.

I have purposely not said anything about tasks and hours. If this Association will agree to the rate of wages it will be better, I think, for each individual to work to that wage and see that he gets its value. The conditions on Estates differ so widely that I do not see how tasks can be fixed. The proposition I now make will bring our rates down proportionately to those of the Klang D. P. A. I propose therefore "that the maximum rates for Tamils be from the 1st. January 33 cts. for men and 25 cts. for women and all Sunday names be abolished." Seconded by G. D. F. Sinclair. Mr. Mulloy pointed out that he would not be able to reduce to these rates at once but would reduce proportionately now and hoped to reduce further later. His estate is an outlying one.

The Chairman said that naturally cases of this sort would receive consideration at the hands of an appeal Committee. After some further discussion the resolution was passed unanimously, and the Secretary was instructed to send copies of the resolution to the Secretaries and Agents of estates in the District in addition to the usual publication in the papers.

3. Appeal Committee.

Mr. Kindersley proposed that all questions of difference in rates of pay from those defined be referred to the General Committee. Seconded by E. W. King, and carried.

4. Labour Delegates to P. A. M.

The Chairman said that at the last meeting of the P. A. M. it was proposed that each D. P. A. should nominate 2 delegates to meet and confer on the question of reduction of wages. These delegates need not necessarily both be planters.

Mr. P. Trump of the P. W. D. on being asked if he would act as one of the delegates expressed himself as willing provided the Government raised on objection.

The Chairman and Mr. D. Kindersley were elected as delegates provisionally.

5 Locusts.

The attention of the meeting was drawn to the letter from the Director of Agriculture which had been sent out to all members.

The Chairman mentioned that so far only two answers had come in. Mr. Schwabe hoped that every one would reply promptly as he knew this district was anxious to do everything in its power to help towards eradicating the pest. Correspondence on this question was quoted shewing that even as far back as Oct, 1912, this Association viewed the locust pest with alarm and offered their help.

6. Roads.

Mr. E. W. King proposed the following resolution—"That in bringing forward their former resolution, this Association did not wish to compare this district invidiously with the neighbouring districts, but would ask them to join in calling the attention of the Government to the present state of some of their roads."

The Chairman seconded and in doing so said he was glad of this opportunity to express his regret that the wording of the resolution passed at the last meeting, and which he had seconded, had conveyed a wrong impression.

DEPARTMENTAL NOTES.

Mr. H. H. Stirrup has been appointed Assistant Agriculturial Inspector, Department of Agriculture, F.M S.

Mr. J. N. Milsum, Assistant Superintendent, Government Plantations. Selangor and Negri Sembilan, Department of Agriculture, F.M.S., arrived at Kuala Lumpur and assumed his duties on 29th November.

Mr. F. T. Brooks has been appointed as Mycologist, Department of Agriculture, F.M.S.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Destination.	Exported during October, 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber, 1913, to date.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,140.41	7,404.58	8,544.99	5,121.60	3,423.39	...	21,907,761	544,892.05
United Kingdom ...	861.57	7,759 06	8,620.63	6,165.24	2,455 39	...	22,728,771	568,219.25
Continent of Europe ...	111.15	1,013.86	1,125.01	842.02	282.99	...	2,983,908	74,597.70
Ceylon	47.54	450.26	497.80	321.67	176.13	...	1,339,068	33,476.70
Other Countries ...	...	...	...	10.45	...	10.45	...	...
Total ...	2,160.67	16,627.76	18,788.43	12,460.98	6,337.90	10.45	48,959,508	1,221,185.70

KUALA LUMPUR,
6th November, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

This year it should be possible, even if the hoped-for assistance of another Europeon assistant chemist is not forthcoming, to deal with from 150 to 250 samples, according to the time occupied by field work, which at present necessarily involves stoppage of the laboratory operations.

Rubber Soils :—Of these all were for estates requiring advice as to the arranging of manurial trials or the treatment of backward or deteriorating areas. The heavy fall in the price of rubber has caused a set back to the employment of fertilisers but it is anticipated that this will be only temporary, and that this branch of the soil work will become of considerable importance.

An extensive series of manurial experiments have been started on the Castleton Estate, Telok Anson, in conjunction with Mr. F. G. Spring. They have been planned to ascertain the effect of lime, nitrogen, potash, and phosphate in all combinations and to test also the difference due to applying them in the various forms in which they are purchasable, as for instance burnt lime against limestone, basic slag against superphosphate.

Each plot is of 2 acres, composed of trees of uniform age and girth. Results will in the first year be expressed in terms of increase of girth, later as yields of rubber.

The experiments as established are to be permanent, the manures being renewed every 2 years in order that ultimate effects, renewal of bark, quality of rubber, etc., may be observed.

Coconut Soils :—An investigation has been commenced on the soil conditions governing the fertility of the coconut tree.

Whereas rubber grows well and affords satisfactory yields on almost any class of soil in which it is planted the coconut tree is much more fastidious. In some places a yield of 20 nuts per tree each year may be taken as the average, in others it reaches 80 or even 100.

Increasing attention is certain to be paid to this cultivation in the near future and any obtainable information which will enable a valuation to be made of the probable quality for this purpose of a given soil cannot fail to be of value to intending cultivators. It is hoped that from the investigation there will also be acquired some knowledge of the manurial and cultural treatment of coconut plantations most likely to prove effective in increasing the output.

Work at present is being confined to districts of noted fertility and will subsequently be extended to others in which the yields are low. The Bagan Datoh soils have been investigated, analyses have been made of a number received from the East Coast, and others from the Batu Gajah and Kuala Kangsar districts are now being dealt with.

Padi soils :—The results of a number of analyses of padi soils and the conclusions derived therefrom were given in the July number of this *Bulletin* and need not be recapitulated. Manurial experiments based on them have been initiated and are being carried out this year in the Rembau and Kuala Pilah districts of Negri Sembilan.

In connection with the various schemes for irrigating padi lands being undertaken by Government soil surveys are being carried out and reports furnished. Two such have been completed, dealing with small schemes at Pulau Tawar and Dong, both in Pahang; in the case of a third, at Laiang-Laiang, Perak, comprising 16,000 acres, the field work has been completed and the laboratory work is now in progress.

Mountain soils :—In September a visit was paid to Gunong Tahan, the site of the proposed hill station, for the purpose of ascertaining whether land suitable for cultivation was to be found at high altitudes. The result was disappointing, for although there is, at a height of 4,500 feet and over, a very large area, probably 3 square miles, that is covered with a characteristic jungle growth and might therefore be expected to be of value, it is established on a soil almosf entirely composed of peat and therefore unsuitable for cultivated crops. Below this peat, at no great depth, is sandstone rock so that potentiality for improvement does not exist. At 5,000 feet the peaty layer is still shallower and supports only a scrubby vegetation and at higher altitudes, 6,000-7,000 ft., the sandstone is covered by only a few inches of loose soil.

Although as stated the great bulk of the land is unsuitable for cultivation several small areas were found, characterised by jungle of a much heavier type, in which a more normal soil has accumulated. It will be possible, it is thought, to utilise these for such purposes as vegetable and perhaps fruit growing on a small scale.

Future Work :—Even with the present organisation it is expected that estate and Government work called for during 1914 will be comfortably dealt with and opportunity remain for other investigations. Of these the first to be carried to completion will be that on coconut soils dealt with above.

The knowledge that will by then have been acquired of the types of soil best suited for the staple cultivations of the country will justify the commencement of survey work of the agricultural possibilities of the districts now being opened up by railway and road development, in the belief that it will be possible thereby to afford to possessors of capital reliable information as to where, in planting pursuits, it may be most profitably employed.

Expression is still frequently heard of the opinion that soil analysis is of little, if any, utility in determining the value of a soil

or the nature of its manurial requirements. This opinion is usually found to be based on experience derived before modern methods of determining the relative proportions of clay, silts, and sand, which afford an invaluable indication of the moisture holding capacity, porosity, etc., were introduced into analytical practice. To it the reply can be made that no other methods than that of considering the data afforded by the chemical and mechanical analyses exists for applying to the unknown a knowledge of the known.

The causes of niceties of difference may not indeed be always ascertainable, but broader distinctions, such as should induce a planter to experiment on methods of improvement, can with certainty be recognized and explained.

The power of predicting that a certain course of treatment will assuredly prove profitable is *not* claimed, but there can be indicated the lines on which success is most likely to lie, and if only the waste of money involved in adopting extravagant programmes on the strength of reputed success elsewhere, perhaps in another country, can be checked, appreciable advance will have been made.

PRICKING OR TAPPING.

By F. G. Spring.

For the purpose of making a comparison of these two systems one hundred 4-year-old rubber trees of approximately equal girth were selected, 50 trees being tapped with the serrated knife and the other 50 with the gouge. The trees tapped with the gouge were marked out on the single quarter system (half herring bone) with two cuts 18 inches apart and tapping was conducted every day at the rate of approximately 20 cuts to the inch. The Northway 4-Point Serrated Knife was used in the other area and tapping conducted on the single quarter system. The following directions for the use of the serrated knife were adopted and are taken from a circular issued by the agents. "The trees may be tapped on the half or full herring bone" principle. The following describes the half "herring bone" system :— A narrow vertical channel is cut in the tree upto a height of 5 feet or more (according to age and size) from its base for carrying the latex. The "Northway Gouge" knife, or any other paring knife, may be conveniently used for this. A space about 1½ inches wide on one side of the channel is then scraped to remove dry bark or other inequalities of surface.

"The knife is then pressed into the tree at either the top or bottom of the vertical channel, and at an angle of about 45 degrees to it, and punctures made one foot apart, thus dividing up the tree into sections of a foot each, in each of which one puncture is made

daily See that a clean puncture is made by inserting and removing the blade sharply without lateral play. After each puncture the exuding latex should be at once guided into the vertical channel (a small twig may be used for this), after which it will continue to flow naturally. Subsequent daily punctures are made ½ inch below the last in each section. This is continued till the sections are finished, a matter of 24 days' tapping, when the whole operation is repeated on the opposite side of the tree. When four such complete sections have been tapped opposite one another, the spaces between are operated upon till the tree is finished, when it will be found that the first portion tapped is ready to be done again. If it is not, the tree may be rested for a few months. Each puncture being only 1½ inches long as opposed to the continuous cut of existing paring systems, and there being no bark removal, the flow of sap is very little interfered with, and the recuperative power of the tree greatly assisted. The result is a healthy tree which continues to improve in yield.

"The serrated blade is that which makes the incisions to bottom of latex cells; the bevel edge is for the purpose of making a very shallow cut or indent in the bark in order to induce the latex to run into central vertical channel. The latter blade should be adjusted to the desired or necessary cutting depth and then the blunt guard on opposite side adjusted."

The trees experimented with in Kuala Lumpur Government Plantation were tapped according to above on the single quarter system with five punctures one foot apart dividing the tree into sections of one foot each. In both experiments tapping was conducted each day.

The following are the results obtained over a period of five months:—

	Serrated Knife.		Gouge.		
	Latex Rubber.	Scrap.	Latex. Rubber.	Scrap.	Bark Shaving.
7th June to 6th July, 1912	2 lb. 11½ oz.	1 lb. 6 oz.	2 lb. 8 oz.	1 lb. 3½ oz.	...
7th July to 6th Aug. ,,	4 ,, 1½ ,,	1 ,, 15 ,,	5 ,, 3½ ,,	1 ,, 11½ ,,	...
7th Aug. to 6th Sept. ,,	6 ,, 11 ,,	1 ,, 10 ,,	4 ,, 8½ ,,	1 ,, 8 ,,	...
7th Sept. to 6th Oct. ,,	6 ,, 2 ,,	1 ,, 4½ ,,	5 ,, 5 ,,	1 ,, 9½ ,,	...
7th Oct. to 6th Nov. ,,	6 ,, 1½ ,,	1 ,, 9 ,,	7 ,, 10½ ,,	1 ,, 6 ,,	...
Total ...	25 lb. 11½ oz	7 lb. 12½ oz.	25 lb. 3½ oz.	7 lb. 6½ oz.	1 lb. 12 oz.

Total Rubber—Serrated Knife = 33 lbs. 8 ozs.
Total Rubber—Gouge = 34 ,, 6 ,,

As far as yield is concerned there is practically no difference in the two systems over a period of the first five months tapping. As the girth of the trees increases there will be a corresponding increase in the length of the cuts where gouge tapping is conducted and a consequent increase in yield in this system, but in the other plot the same increase in yield can hardly be expected as the size of the cuts always remain the same, and if the number of cuts be increased as the tree becomes older, to more than five one foot sections, tapping becomes more difficult and expensive. The next point to be considered is cost of labour in the two areas. I find that when using the Northway Serrated Knife the cost of Labour is about double that where the gouge is used, an important point on an estate. The time lost in using the serrated knife I found due to the following:—

1. Placing the knife at the correct angle in five separate sections.
2. Guiding the latex.
3. Collecting scrap.

After the period of five months' tapping the trees were left untapped for one year and then closely examined. As regards the health of the tree in the case of the gouge it is unnecessary to deal, as it is well known that renewal of bark depends largely on the quality of tapping. In the case of the serrated knife no injury to the tree could be found.

PRODUCTION OF PAPER PULP FROM GRASSES.

Review by B. J. Eaton.

In view of the installation of an experimental paper pulp plant at the Agricultural Department and information published recently on the production of paper pulp from one of the wild ginger plants, *Hedychium coronarium*, and previously on lallang grass, in this country, for the same purpose, the following abstract of an instructive pamphlet written by Mr. W. Raitt—Cellulose Expert attached to the Forest Research Institute Dehra Dun—should prove of interest. The pamphlet in question deals with the Savannah grasses of India and treats very fully of their value as raw materials for paper pulp.

As is probably well known, wood pulp has replaced superior materials such as linen and rags, esparto and other grasses especially for the cheaper qualities of paper, newspapers, etc., and has assumed large proportions, particularly in Europeon countries such as Norway and Sweden, and in Canada.

The successful production of wood pulp depends on cheap transport and labour, suitable woods and cheap power such as water power, since a comparatively large amount of power is consumed in grinding the materials. It would seem doubtful whether the condi-

tions in this country are suitable, in respect of these factors, for the manufacture of wood pulp for paper making.

On the other hand, one grass in particular, *Imperata acundinacea*, commonly known as lallang, is ubiquitous and its utilisation as a raw material for paper making has been considered and its manufacture on a small scale is being carried on at present I believe, in this country.

Great interest was taken about a year ago in another plant, *Hedychium coronarium*, a species of wild ginger, known to exist in large quantities in South America and which it was thought might be introduced successfully into this country or possibly be indigenous. Species of wild gingers are now being cultivated at the Experimental Plantation, Kuala Lumpur, with a view to the experimental manufacture of paper pulp shortly. One of the principal factors required in this connection is a large quantity of raw material.

The highest qualities of paper are manufactured from rags, waste linen, etc., secondly from exported cereal straws and one or two other grasses such as Baib, (*Ischaemum angustifolium* in India, and finally the lower grades from wood pulp.

Among the grasses, (Gramineae,) is included Bamboo, which will probably be found of value for this purpose, but is not included among the ordinary grasses which have only slightly lignified culms since Bamboo requires special digestion for purification and extraction of cellulose. Bamboo in this country may prove to be a useful raw material for the manufacture of paper pulp. The writer of the pamphlet referred to, shows that the following factors are important, in connection with the utilisation of grasses for the manufacture of paper pulp:—

(1) Associated growth—in which two or more grasses are growing together, so that satisfactory separation is impossible, but similar digestion and bleaching treatment can be given to each, and the different species treated as one.

(2) Mixed growth—in which the grasses exist near each other in separate clumps, necessitating more time in collection, when only one grass is suitable, or tending to increase the danger of a dishonest or ignorant coolie collecting the unsuitable as well as the suitable species.

(3) Weed growth—*i.e.*, mixtures of grasses occurring together in the same clump so that separation of unsuitable species necessitates hand-picking and becomes very expensive.

The pulp manufacturer has to adopt a treatment in respect of digestion and bleaching, which is most suitable for the most predominant species in order to obtain a suitable pulp consisting of practically pure cellulose, and if quantities of very resistant species are

present there will be considerable loss by hydrolysis of the more easily reducible material.

Modern methods of extraction of the pulp have enabled mixtures containing small quantities of resistant species to be separated satisfactorily after reduction to pulp.

The author has, on this account, divided the Savannah grasses of India into two main divisions, (1) those of major importance because of the quantities available and their predominance in their respective areas; (2) those of minor importance in respect to quantity, but found mixed or associated with the important species.

The grasses of major importance are as follows :—

Saccharum spontaneum.	Anthistiria gigantea.
,, arundinaceum.	(s.s. Villosa).
,, munja.	Imperata arundinacea.
,, parenga.	Eragrostis cynosuroides.
Arundo donax	Phragmites karka.
Anthistiria gigantea (s.s. Arundinacea).	

The only one of these which exists in large quantities in this country is Imperata arundinacea (lallang) although the large swamp grasses found sometimes on large areas here, may be among the above.

The following reasons are given for the consideration of these grasses as possible or probable raw materials :—

(1). The demand for grass pulp and other forms of cellulose is in excess of the supply and nothing further can be expected of materials already in use.

(2). The improvement of modern methods of extraction and recovery of chemicals used in digestion, etc.

(3). Improved methods for extracting unreduced materials mechanically from pulp.

(4). The development of the industry, which now consists essentially of two distinct branches (1) pulp making (2) paper making: The first is now carried on near the source of raw material, thus saving transport of useless material, while the latter is carried on nearer the distribution area of the final product.

The stage in the growth of the various grasses, at which the tbest results are obtained, is shewn to be prior to or during the flower ing stage, since while the seed is maturing, considerable lignification akes place, and this causes loss of cellulose, owing to the more-severe digestion required to reduce lignified material.

This again has an important bearing on crop, since if the seed is unable to ripen and germinate, the plant has to reproduce vegetatively and the tendencyis to weaken the plant and reduce subsequent crops. With this factor in view the writer recommends a larger area than that actually necessary for the amount of pulp required, to enable the plant to seed. Thus for a grass which seeds annually,

double the area necessary to produce a requisite quantity of pulp, should be taken, to ensure a two year rotation or cropping.

Interesting figures are given shewing the cellulose contents of the different grasses, and the yields obtained after digestion and bleaching, which do not necessarily bear a direct relation to each other.

Thus, while *Anthistiria gigantea* has a cellulose content of 50.7% and yields 39 % of bleached pulp, *Imperata arundinacea* which has a cellulose content of over 54% only yields 35% of bleached pulp. The most suitable temperatures and pressures for digestion and period of digestion required are given in each case, with the yields obtained, and remarks on the quality of the final product.

General Conclusions :—

From the results obtained it is concluded that out of 10 species of major importance and 8 species of minor importance, two of the former and three of the latter are of doubtful value owing to inferior quality or unsuitable because they do not yield clean pulps under the standard conditions applicable to the majority of the grasses of major importance. These species are therefore unsuitable as mixtures.

It is disappointing however to find *Imperata arundinacea* (lallang) included in this list as inferior, especially since in this country, as in India, it would certainly be a grass of major importance in respect to quantity available and predominance over large areas.

This inferiority is due principally to weakness and shortness of fibre and difficulty of bleaching. Since lallang grass as a raw material for the production of paper pulp has been favourably reported on in this country, it may possess different qualities, depending on soil, moisture conditions, etc.

A sample of normal-air-dried lallang, containing 11.6% of moisture, prepared in this country, was found by the writer of this review to contain 57.1% of cellulose, which is higher than that given for the Indian material. The material examined by me had undergone preliminary treatment. Suggestions for improving the methods of extraction by first crushing the more resistant nodes of the grasses between rollers and economising soda by preliminary treatment of the material in water to remove starch and other soluble constituents, which increase the soda consumption, are also given. Finally, the cost per ton of unbleached pulp at the factory is estimated in each case, although certain items of expenditure are uncertain.

The order in which the grasses of major importance are placed as regards commercial value is as follows :—

(1). Anthistiria gigantea sub-sp. arundinacea.
(2). „ „ „ „ villosa,
(3), Saccharum munja,

(4). Ischaemum angustifolium.
(5). Phragmites karka.
(6). Saccharum arundinaceum.
(7). „ parenga.
(8). „ spontaneum.
(9). Arundo donax.

It will seen that Baib (Ischaemum angustifolium) which is already used commercially takes fourth place on this list.

The figures given shew that the cost of production is less than the delivered cost of European wood pulp imported into India to make up for the shortage of Baib.

An instructive preface is written to the pamphlet by Mr. R. S. Hole, Botanist at the Forest Research Institute Dehra Dun, dealing with the growth of the different grasses, flowering periods and probable crops, together with the rotation necessary to allow seeding to take place. One species, *Saccharum arundinaceum* appears to be outstanding with regard to yield, as it produces 44.3 tons of dry grass per acre in one cutting or an estimated annual yield of 14.8 tons, calculated on a suggested 3 year rotation.

It is interesting to compare this yield with that of *Hedychium Coronarium* which is 6-10 tons of dry material per acre, and which is said to be greater than that of any other product for paper pulp; ~~this~~ latter is thus seen to be considerably less than the grass. This large yield is however due to the habit and growth of the plant, as this species attains a height of 25 feet and the culms have a diameter of ¾ inch, thus resembling sugar-canes or bamboos in its general growth.

PROGRESS REPORT ON LOCUST WORK TO NOVEMBER 30th, 1913.

Federated Malay States.

So far as can be ascertained, locusts are still confined in the Federated Malay States to the States of Selangor and Negri Sembilan. Rumours of swarms having reached Perak have so far proved to be without foundation. The most Northerly limit of distribution at the end of the month is Kuala Kubu. Southward the locusts extend in a series of areas which roughly follow the main road from Kuala Kubu through Kuala Lumpur and Kajang to Seremban and Tampin. Many swarms of hoppers have been reported from Malacca territory. The Southern limit of distribution in the Peninsula cannot be ascertained. The most Easterly record is for Ayer Kuning in the South-east corner of Negri Sembilan.

No locusts have yet been reported from Pahang. There is, however, the possibility of swarms of flying locusts having crossed unobserved from Selangor; swarms also which have been lost sight of while flying Eastwards from Kuala Pilah in Negri Sembilan may have reached Pahang, where they may easily have bred unobserved.

It will thus be seen that since the previous generation, when fliers were observed as far North as Tanjong Malim, and when eggs were laid at Rasah, there has been no Northerly advance. This is a matter of the utmost importance in view of the large areas under padi in Perak, Province Wellesley, and Kedah, especially as it has recently been demonstrated in Negri Sembilan that locust eggs will hatch quite readily in the wet mud of the padi fields provided there is no standing water on the sawahs.

Selangor.

There have been no hoppers in Selangor during November. The attention of the Special Assistant and of the locust staff has been directed to keeping watch on all the swarms of fliers in the State. The number of swarms decreased from the beginning of the month onwards. The reason for this, doubtless, is that swarms joined forces. This conclusion is supported by the fact that the number of small swarms decreased and the big swarms became more numerous. There are now under observation twenty swarms, of which six are small, three larger, and eleven big. They are distributed as follows:—

Kuala Kubu and Serendah	4 swarms
Rawang	3 ,,
Kuala Lumpur	4 ,,
Setapak and Ulu Klang	2 ,,
Ulu Langat	7 ,,

Egg laying is expected to commence shortly, and a careful watch is being kept on the swarms to endeavour to locate the breeding grounds.

Negri Sembilan.

From the appended summaries of the number of swarms destroyed, and tins of hoppers caught in Negri Sembilan during October and November, it will be seen that the swarms there were very numerous, and individually small. An immense amount of labour and the spending of much time was thereby entailed in transporting apparatus. The difficulties of the work greatly increased by the inaccessibility of many of the swarms, some being many miles from road or railway.

The periodicity which is so marked a feature in the alternation of fliers and hoppers in Selangor is not so marked in Negri Sembilan. The generations have been overlapping in the Coast District for the

last three months, both hoppers and fliers being present in the district throughout the whole of the time. This overlapping of generations appears to be extending to Tampin District and slightly to Seremban where eggs have been hatching throughout a period of nearly two months, and reports of first instar hoppers were still being received.

The distribution of the locusts has altered somewhat since the previous generation, when Seremban, Pantai, Sungei Gadut, Siliau and Port Dickson, Rembau, and Tampin were the six areas in which locusts were numerous. Of those areas, Seremban, Pantai, and Tampin have been free from hoppers during the present generation, the present distribution being:—

Seremban District.	Lengging and Broga.
	Mambau and Rantau.
Coast District.	Throughout.
Tampin District.	Kampong Batu and Lubok China.
	Keru and Tebong.
Kuala Pilah District.	Gemenchi.
	Jelei.

The known area of distribution is thus very wide, and efficient supervision could, therefore, not be carried out by the three Special Assistants appointed to Negri Sembilan. Fortunately the coincidence of the flying stage in Selangor with the hopping stage in Negri Sembilan set free one of the Special Assistants for Selangor to assist in the field work in Negri Sembilan.

Labour has not always been easy to obtain. Much of the work has been done by Malay coolies, but as the padi harvest was in full swing in some districts the Malays were often unwilling to work in the locust gangs. The co-operation of the District Officers greatly assisted in overcoming this difficulty. After the harvest no trouble is anticipated in obtaining labour as the Malays are quite awake to the necessity of destroying the locusts.

Most of the locusts destroyed have been dealt with by the sheeting and bag-trap method described in the *Agricultural Bulletin* for October. This method is not, however, applicable to swarms in padi, as driving across the wet sawahs is almost impossible. Instead, small quantities of crude oil or kerosene were poured on the water in the flooded sawahs, and the hoppers shaken off the padi into the oil by means of long bamboos. Immersion in water has little or no effect upon the hoppers, but when a thin film of oil is added, the locusts which fall in are quickly killed. By this method many swarms were wiped out which could not otherwise have been dealt with. The method commends itself to the Malays as it destroys at the expense of very little exertion those locusts which are

obviously doing them injury. The work is light, and can easily be done by the women and children.

The above method was first suggested and tried by the Government Entomologist.

A large number of breeding grounds was reported from Malay kabuns and from estates. Many of these breeding grounds were changkolled to a depth of four or five inches, and the soil broken up to expose the eggs. Owing to unpropitious weather conditions the value of the method could not be determined. Heavy rain after changkolling covered the majority of the eggs with wet earth, thus undoing the work that had just been done.

At Rantau a big swarm chose the padi fields for their egg-laying ground. At the time there was no free water on the sawahs but the mud was quite wet and soft. The eggs were laid in enormous numbers over many acres, there being in places as many as ten egg-holes to the square inch. Development appeared to proceed normally notwithstanding the wet environment. Just as the hoppers were beginning to emerge, heavy rain fell, the padi was flooded, and the majority of the young locusts were drowned in the egg. Wherever it is possible to flood a breeding ground, this is the most effective way to destroy the unhatched locusts.

It may be well to remind owners and occupiers of land of the necessity of notifying an Inspecting Officer, or the nearest Land Office or Police Office, of the presence of locusts on their land, as laid down in Section 13 of "The Agricultural Pests Enactment, 1913." European planters generally have given the Special Assistants every facility for dealing with hoppers on their estates, but there are a few who have apparently overlooked the Section mentioned, and who have not yet awaked to the fact that the locusts in this country are a serious menace which calls for public spirited action. Only by hearty co-operation on the part of all the planting community will it ever be possible to make a complete success of the present locust campaign.

A new generation of hoppers is to be expected shortly in Selangor. It will probably facilitate the location of swarms on estates where otherwise they might go unrecorded for some considerable time after hatching, if Managers will make it known among their mandores and coolies that rewards will be paid them for the first report of any breeding ground or swarm of hoppers. The scale of rewards now in operation is as follows:—

For reporting a breeding ground	$10.00
,, ,, swarm of first instar hoppers ...	5.00
(No brown markings on cheeks or body)	
,, ,, swarm of 2nd to 5th instar ...	2.00
(Cheeks or body show brown or yellow markings)	

Summary of Locust Destruction, Negri Sembilan, October, 1913.

District	Special Assistant	Swarms	Kerosene Tins
Seremban	Wolde	8	22
Coast	Tollemache	44	85
Tampin and Kuala Pilah		19	186
	Total	71	293
	November, 1913.		
Seremban	Wolde	116	330
Coast	Tollemache	170	346
Kuala Pilah and Tampin	Peche	49	891
Kampong Batu	Keane	27	179
		362	1,836

Preliminary General Circular.

ASSOCIATION SCIENTIFIQUE INTERNATIONALE D'AGRONOMIE COLONIALE ET TROPICALE.

THIRD INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE, LONDON, 1914.

Preliminary Notice.

The International Association for Tropical Agriculture (Association scientifique internationale d'Agronomie coloniale et tropicale) has decided to hold in London, in June, 1914, an International Congress, in which all countries interested in Tropical Agriculture and Forestry are invited to participate. The Association has requested the Committee of the British Section, whose headquarters are at the Imperial Institute, to make the necessary arrangements for the meeting, in co-operation with the Bureau of the International Association in Paris.

The Congress will be held at the Imperial Institute, South Kensington, London, S.W. It will open on Tuesday, June 23rd, and close on Tuesday, June 30th, 1914.

Order of Business.

In the order of business at the Meeting, the morning sittings (10 a.m. to 1 p.m.) will be reserved for papers and discussions on subjects of general importance, each morning being devoted to a single subject; the afternoon sittings (3 to 5 p.m.) will be reserved for papers and discussions on special subjects.

Transactions.

Communications intended for the Congress may be made in English, French, German or Italian; but the general language of the Congress will be English.

The following subjects are suggested for papers and discussion at the morning meetings. Contributions on these and similar subjects are invited :—

I. Technical Education and Research in Tropical Agriculture.
II. Labour Organisation and Supply in Tropical Countries.
III. Scientific Problems of Rubber Production.
IV. Methods of developing Cotton Cultivation in New Countries.
V. Problems of Fibre Production.
VI. Agricultural Credit Banks.
VII. Agriculture in Arid Regions.
VIII. Problems in Tropical Hygiene and Preventive Medicine.

Papers for the afternoon meetings are invited on the following subjects :—

I. Problems relating to Tropical Agriculture and Forestry.
II. The Cultivation and Production of—

Rubber.	Tea.
Cotton and Fibres.	Coconuts.
Cereals and other Foodstuffs.	Other Agricultural Products.
Tobacco.	Forest Products.

III. Plant Diseases and Pests affecting Tropical Agriculture.

Papers recommended for publication and Reports of Discussions will be published at the close of the Congress.

Subscription.

The subscription for membership of the Congress will be £1, entitling members to admission to all meetings and receptions and to receive the volume of printed papers and discussions, on publication. Those desiring to become members of the Congress are requested to fill in an enclosed form and return it to the Organising Secretaries for the Congress, as soon as conveniently possible, in order that their names and permanent addresses may be registered.

Notices.

A General Programme, with the complete arrangements, will be forwarded to all registered members before the Meeting.

Arrangements will be made for the accommodation of members of the Congress at suitable hotels.

Arrangements have been made by the Organisers of the International Rubber Exhibition and of the International Cotton, Fibres, and Allied Industries Exhibition to hold these Exhibitions during the period of the Congress, at the Royal Agricultural Hall, Islington, London, N. Members of the Congress will receive free Season

tickets of admission to the Exhibitions; and special means of conveyance between the Imperial Institute and the Agricultural Hall will be provided.

The Organising Committee cordially invite all who take an interest in Tropical Agriculture and Forestry to attend the Congress and to make the contents of the present circular as widely known as possible.

All correspondence relating to the communication of papers and the arrangements for the Congress should be addressed to:—

The Organising Secretaries,

Third International Congress of Tropical Agriculture,
Imperial Institute,
London, S.W.

WYNDHAM R. DUNSTAN,
President of the International Association & Chairman of the Organising Committee for the Congress in London.

F. HEIM,
Secrétaire Perpétuel de l'Association Internationale, Paris.

T. A. HENRY,
H. BROWN.
Honorary Organising Secretaries of the Congress in London.

To the Organising Secretaries of the Third International Congress of Tropical Agriculture, Imperial Institute, London, S.W.

I desire to become a member of the Third International Congress of Tropical Agriculture, to be held in London in June, 1914; and I enclose* ....
for £1 (One Pound) in payment of my subscription.

It is my intention to be present at the Congress.

*Cheques to be crossed and made payable to the Secretaries, Congress of Tropical Agriculture.

Please write distinctly—

Full name ....

Title or designation ....

....

Address to which all communications should be sent:

....

....

....

(Name and address should be given in the form in which it is desired that these should appear in the official publications of the Congress).

Date ...., *191* .

Membres du Bureau International de l'Association

Président en exercice (1910-1915) :

M. le Prof. Dunstan, Directeur de l'Institut Impérial, Londres Membre de la Société royale de Londres,

Président sortant (1-ère période d'exercice, 1905-1910) :

M. le Prof. J. L. de Lanessan, ancien Ministre, ancien Gouver neur Général de l'Indo-Chine.

Vice-Présidents :

Allemagne.—M. le Prof A. Engler, Membre de l'Académie des Sciences de Berlin, Directeur des Musée et Jardin botanique royaux de Berlin, et de la Station botanique centrale pour les Colonies allemandes.

M. le Prof. Dr. Wohltmann, Conseiller privé, Directeur de l'Institut agricole de l'Université de Halle sur Saale.

Angleterre.—M. le Colonel Sir D. Prain, Directeur du Jardin royal, Kew, Membre de la Société royale de Londres.

Indes-britanniques.—M. Bernard Coventry, Conseiller agricole du Gouvernement.

Belgique.—M. Ch. Liebrechts, Conseiller d'Etat à Bruxelles.

M. E. Leplae, Directeur général de l'Agriculture du Congo Belge, au Minisrère des Colonies à Bruxeller.

M. E. de Wildeman, Directeur du Jardin botanique de l'Etat.

Brésil.—S.E.M. Olyntho de Magalhaes, Ministre du Brésil à Paris.

Egypte.—M. G. C. Dudgeon, Directeur général de l'Agriculture au Caire.

Equateur.—S.E.M. le Dr. Rendon, Ministre de l'Equateur à Paris.

Espagne.—M. le Prof. Vincente Arche, Chef des Services de l'Enseignement et de l'Expérimentation agricoles, au Ministère de l'Agriculture, à Madrid.

M. E. Gomez Flores, Chef du Service agronomique des Canaries, à Las Palmas.

France.—M. le Myre de Villers, Ambassadeur, Président honoraire de la Société d'Acclimatation de France.

M. le Prof. Muntz, de l'Institut national agronomique, Membre de l'Académie des Sciences de Paris.

M. le Prof. Edmond Perrier, Directeur du Muséum national d'Histoire naturelle, Membre de l'Académie des Sciences de Paris.

M. le Prof. Prillieux, de l'Institut national agronomique, Membre de l'Académie des Sciences de Paris.

M. le Dr. Roux, Directeur de l'Institut Pasteur, Membre de l'Académie des Sciences de Paris.

M. Tisserand, Directeur honoraire de l'Agriculture de l'Académie des Sciences de Paris.

Italie.—S.E.M. le Prof. Nitti, Ministre de l'Agriculture, de l'Industrie, et du Commerce à Rome.

S.E.M. le Prof. Sanarelli, Secrétaire d'Etat au Ministère de l'Agriculture, de l'Industrie et du Commerce à Rome.

M. le Comte Sabini, Attaché commercial a l'Ambassade d'Italie à Paris.

Mexique.—S.E.M. de Mier, ancien Ministre du Mexique à Paris.

S.E.M. Olegario Molina, ancien Ministre de l'Agriculture à Mexique.

Pays-bas.—M. le Prof. H. J. Lovink, Directeur général du Départment de l'Agriculture, des Indes néerlandaises à Buitenzorg.

Portugal.—M. le Prof. Freire D'Andrade, Directeur général des Colonies, au Ministère des Colonies, à Lisbonne.

S.E.M. le Prof. Batalha-Reis, Ministre du Portugal à Saint-Pétersbourg.

M. le Prof. J. Henriques, Directeur du Jardin botanique de l'Université de Coimbra.

M. le Prof. de Monte-Pereira, ancien Directeur au Ministère des Colonies, à Lisbonne,

Russie.—M. le Prof. Boris de Fedtschenko, du Jardin botanique impérial de Saint-Pétersbourg.

Turquie—M. le Prof. Hassib Bayindirly, Directeur de l'Enseignment agricole au Ministère de l'Agriculture, à Constantinople.

Administrateur-Trésorier :

M. S. de la Rupelle, Secrétaire général de la Société générale pour favoriser le développement des Commerce et de l'Indústrie à Paris.

Secrétaire Perpétuel :

M. le Dr. F. Heim, Professeur a l'école nationale supérieure d'Agriculture coloniale, et au Conservatoire nationale des Arts et Métiers.

Organising Committee for the Congress in London.

Chairman—Prof. Wyndham, R. Dunstan, C.M.G., M.A., LL.D., F.R.S.,

Members.

Mr. M. Kelway Bamber, Government Chemist, Ceylon.

Mr. J. R. Blackwood, Director of Agriculture, Bengal.

Mr. J. R. Bovell, I.S.O., Superintendent of Agriculture, Barbados.

Mr. I. H. Burkill, M. A., F.L.S., Director of Gardens, Singapore.

Prof. P. Carmody, Director of Agriculture, Trinidad.

Mr. D. T Chadwick, Director of Agriculture, Madras.

Mr. B. Coventry, C.I.E., Agricultural Adviser to the Government of India.

Dr. C. W. Daniels, Medical Adviser to the Colonial Office, London.

Mr. M. T. Dawe, Director of Agriculture in the Territory of the Mozambique Coy.

Prof. F. Debono, Inspector of Agriculture, Malta.

Mr. G. C. Dudgeon, Director-General of Agriculture, Egypt.

Mr. P. R. Dupont, Curator, Botanic Station, Seychelles.

Dr. E. Goulding, Imperial Institute, London.

Mr. E. Ernest Green, late Government Entomologist, Ceylon.

Mr. W. S. Hamilton, Director of Agriculture and Industries, Punjab.

Prof. J. B. Harrison, C.M.G., Director of the Department of Science and Agriculture, British Guiana.

Mr. W. Hopkins, Director of Agriculture, Sierra Leone.

Mr. A. E. Humphries, Chairman, Home-grown Wheat Committee.

Mr. J. A. Hutton, Chairman, British Cotton-Growing Association.

Mr. W. H. Johnson, Director of Agriculture, Southern Nigeria.

Mr. C. H. Knowles, Superintendent of Agriculture, Fiji.

Mr. P. H. Lamb, Director of Agriculture, Northern Nigeria.

Mr. L. Lewton-Brain, Director of Agriculture, Federated Malay States.

Mr. R. N. Lyne, Director of Agriculture, Ceylon.

Mr. A. C. MacDonald, Director of Agriculture, East Africa Protectorate.

Mr. J. MacKenna, Director of Agriculture, Burma.

Mr. J. S. J. McCall, Director of Agriculture, Nyasaland.

Mr. F. C. McClellan, Director of Agriculture, Zanzibar.

Mr. J. McSwiney, Director of Land Records and Agriculture, Assam.

Dr. E. A. Nobbs, Director of Agriculture, Rhodesia.

Lt-Col. Sir D. Prain, C.M.G., C.I.E., LL.D., F.R.S., Director, Royal Botanic Gardens, Kew.

Mr. H. N. Ridley, C.M.G., F.R.S., Late Director of Gardens and Forests, Singapore.

Mr. S. Simpson, B.Sc., Director of Agriculture, Uganda.

Mr. H. Hamel Smith, Editor of "Tropical Life," London.

Mr. F. A. Stockdale, Director of Agriculture, Mauritius.

Sir Stewart Stockman, Chief Veterinary Officer, Board of Agriculture and Fisheries, London.

Mr. W. S. D. Tudhope, Director of Agriculture, Gold Coast.

Mr. W. T. Tutcher, Superintendent, Botanical and Forestry Department, Hong Kong.

Dr. F. Watts, C.M.G., Imperial Commissioner of Agriculture for the West Indies.

Dr. T. A. Henry, Imperial Institute, London, } Honorary
Mr. Harold Brown, Imperial Institute, London, } Secretaries.

THE GARDENS' BULLETIN.

We are pleased to note the appearance of the first issue under this name of the *Gardens' Bulletin of the Straits Settlements*. For the sake of convenience, this number is taken as No 6 of a volume which includes the five parts published of the unfinished volume of the *Agricultural Bulletin, S S. and F.M.S.*

It is not proposed to issue the *Gardens' Bulletin* regularly, but it will appear from time to time as material becomes available, and the Editor promises that more original matter will be provided than formerly, a promise that the present number well bears out.

The *Gardens' Bulletin* is intended to continue the scientific and economic botanical side of the old *Agricultural Bulletin, S.S. and F.M.S.*, as the *Agricultural Bulletin, F.M.S.*, does its scientific and practical agricultural side.

Of interest particularly to planters in the present issue is the article on the Coconut Beetles, *Oryctes rhinoceros* and *Rhyncophorus ferrugineus*. It describes and explains the spread of these beetles, their habits and methods of dealing with them as studied and worked out in Samoa, German East Africa, Ceylon, India and Malaya. The principal means of control, of course, is the destruction of all accumulations of vegetable refuse in which the beetles breed. A trap used in Samoa and which might be of use on estates, if properly looked after, is also described.

The price lists of ornamental and economic plants which can be obtained at the Singapore Botanic Gardens will be of interest to all who wish to add to their collections.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Destination.	Exported during Nov. 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease	Value of rubber exported, 1913.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons	Tons.	$	$ c.
Straits Settlements ...	1,169.70	8,544.99	9,714.69	5,773.45	3,941.24	...	23,780,901	590,043.86
United Kingdom ...	746.79	8,620 63	9,367.42	6,771.65	2,595.77	...	23,856,103	596,402.50
Continent of Europe ...	95.36	1,125.01	1,220.37	939.51	280.86	...	3,131,970	78,299.25
Ceylon	49.75	497.80	547.55	354.97	192.58	...	1,413,302	35,332.50
Other Countries ...	...	...	...	10.45	...	10.45	...	...
Total ...	2,061.60	18,788 43	20,850.03	13,850 03	7,010.45	10.45	52,182,276	1,300,078.11

KUALA LUMPUR,
5th December, 1913.

W. J. P. HUME,
Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of November, 1913.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	147.	79.1	83.90	70.93	12.97	76.4	.854	74.5	.86%	...	28.56	5.20
Malacca, Durian Daun Hos.	29.912	144.8	81.	85.3	71.7	13.6	78.5	.935	...	.89	N. W.	10.28	1.79
N. Sembilan, Dist. Hospital Seremban	...	148.5	77.8	88.7	71.4	17.3	75.4	.834	73.7	.87	N. W.	15.89	1.80
,, Dist. Hos. K. Pilah	...	154.8	79 4	86.6	73.6	13.	77.6	.908	76.3	.90	...	16.11	2.86
,, ,, Tampin	...	151.	78.9	...	...	...	75.6	.825	73.4	.83	...	14.73	2.58
,, ,, P. Dickson	...	155.6	80.4	86.6	73.6	13.	76.9	.856	74.5	.82	...	11.98	2.30
Pahang, ,, K. Lipis	...	...	79.4	88.6	67.6	21.	75.4	...	...	...	...	11.63	3.00
Penang, ,, Penang	29.847	144.5	80.9	87.5	72.7	14.8	77.1	.850	73.3	82.6	...	18.56	3.21
Perak, ,, Taiping	...	104.	79.85	91.	70.	21.	76.5	.849	...	.85	...	32.16	3.76
,, ,, Ipoh	...	...	79 96	90.	69.	21.	75.97	.843	...	.84	...	21.43	2.85
,, ,, T. Anson	...	...	80.45	90.	71.	19.	77.05	.885	...	.87	...	16.70	2.12
,, ,, P. Buntar	...	...	79.72	89.	71.	18.	76.14	.855	...	.85	...	17.35	2.58
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	38.45	5.85
Selangor, General Hospital Kuala Lumpur	...	118.4	79 9	89.3	77.2	12 1	76.9	.864	74.7	.84	S. E.	12.79	2.72
,, Dist. Hos. Klang	...	...	78.8	85.	72.3	12.7	75.7	...	...	...	...	14.36	1.65
,, ,, K. Selangor	...	...	...	86.7	74.5	12.2	...	...	...	...	...	9.98	1.65
,, ,, Rawang	...	...	...	91.	71.8	19.2	...	...	...	...	...	11.81	1.66
Singapore, Kandang Kerbau Observatory	29.902	160.4	81.3	91.2	71.	20.2	77.4	.883	...	.83	S. W.	16.37	3.13

THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

No. 7.] FEBRUARY, 1914. [Vol. II.

PARASITIC FLOWERING PLANTS ON RUBBER TREES.

BY F. T. BROOKS.

During a recent visit to an estate in Negri Sembilan it was noticed that a considerable number of old Para rubber trees were attacked by two kinds of parasitic flowering plants in a manner similar to that in which mistletoe attacks certain trees in Europe. These flowering plants possess green leaves but weaken the host by obtaining supplies of water and mineral salts from the branches to which they are attached by means of suckers. Several of the rubber trees carried many of these parasitic growths which were evidently doing considerable damage, the portions of the branches beyond the place of attachment of the parasite being killed in a number of cases.

The area which was most severely affected by these parasitic flowering plants consisted almost entirely of trees in poor condition. They had probably been over tapped some years ago and were badly burred. The foliage was thin and it was probably this circumstances which enabled these parasites to become established, for in a tree possessing a healthy and vigorous leaf canopy the light below the crown of the tree would probably be sufficiently reduced to prevent the development of these troublesome plants.

All branches bearing such growths should be cut out and efforts should be made by manuring to stimulate a more vigorous development of the rubber trees. The trees should be rested until a better leaf canopy has developed.

The two species of flowering plant which are causing this trouble have not yet been indentified but it is hoped to do this shortly; meanwhile a more detailed investigation is proceeding.

Both of the parasites concerned have simple, entire leaves which are quite different from those of *Hevea brasiliensis;* the leaves of one of the parasites are long and narrow, about 2″ by ½″, the leaves of the other are about 3″ by 2″.

Both parasites spread along the branches of the rubber trees by means of creeping stems which drive suckers into the host at intervals. Owing to their distinctness the presence of these parasites on rubber trees can be easily determined.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA.

Held at the Lower Perak Club, Telok Anson, on January 11th 1914, at 10.30 a.m.

PRESENT.

Mr. R. W. Munro, Chairman.
Mr. H. C. E. Zacharias, Secretary.
and the following delegates:—

From Negri Sembilan P. A.	.. ..	Mr. E. A. Tayler.
,, ,, ,, ,,	.. ..	,, S. S. Crisp.
,, ,, ,, ,,	.. ..	,, C. Ritchie.
,, Batu Tiga D. P. A.	.. ..	,, G. H. Bennett.
,, ,, ,,	.. ..	,, T. J. Cumming.
,, Central Perak P. A.	.. ..	,, A. B. Milne.
,, Johore P. A. ..	.. ..	,, J. Bruce.
,, Kuala Lumpur D. P. A.	..	,, F. C. Jeavons.
,, Ulu Selangor D. P. A.	..	,, W. de L. Brooke.
,, Kuala Langat D. P. A.	..	,, H. L. Carter.
,, Taiping D. P. A.	.. ..	,, H. de Z. Lancaster.
,, Batang Padang D. P. A.	..	,, E. Dane.
,, ,, ,, ,,	..	,, C. Darby.
,, Lower Perak P. A.	.. ..	,, M. Maude.
,, ,, ,, ,,	.. ..	,, W. Dell.
,, Bagan Datoh P. A.	.. ..	,, J. M. Counsel..
,, ,, ,, ,,	.. ..	,, R. H. W. Davidson.

Honorary Member: The Dir. of Agriculture (Mr. L. Lewton-Brain).

Visitors: Messrs. F. G. Spring, L. C. Brown, J. C. Osborne, E. E. Lawford, F. T. Millard, L. Hopkins, C. Peters, G. T. Lachlan, G. Wiseman, R. G. Bayley, W. D. Tait, H. Money, T. A. Manchip, T. L. Stevens, B. H. Levi, H. J. Cooper, W. Plummer, P. A. Tyler, E. J. Koch, B. Bunting, G. G. Jeavons, B. Johnson, A. W. Wilson, L. R. Harley and J. Cruickshank.

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1. The Minutes of the Meeting held on October 5th are taken as read, confirmed, subject to the substitution on page 27, line 8, of the word "might" for "would."

2. London 1914 Exhibition.

The Secretary reports having received to date promises from 77 Companies, aggregating $9766.11; and reads correspondence, between himself, the Under-Secretary, F. M. S., and the Rubber Growers' Association.

The *Director of Agriculture* reports progress made and at the request of the meeting undertakes the collection of exhibits &c., as was done in the case of the New York Exhibition.

3. Batavia Congress.

The Secretary places on the table a guide book to the Exhibition, published by the Organizing Committee, and reads the following letter:—

"Permatang Estate,
Banting,
Selangor, F. M. S."

"W. E. Van Rynberk, Esq.,
Secretary to the Sub-Committee,
Batavia Congress and Exhibition,
SINGAPORE."

"Dear Sir,

I am duly in receipt of your letter of September 29th for which I thank you.

At a meeting of the Planters' Association of Malaya held on the 5th instant in Kuala Lumpur, I took the opportunity of conveying to the members present the salient points of your letter, and it was the general feeling of the meeting that support of some kind or other should be given by the planting community in the way of an Exhibit, having in mind specially the fact that the Executive Committee at Batavia had expressed its willingness to assist in the question of finance should it be considered necessary to ask for any assistance of this sort. On behalf of the members of our Association I shall be glad if you will convey in suitable terms our appreciation of this offer.

The meeting quite agreed that the question is one affecting the whole of the Eastern rubber producing community, and now that we are face to face with so serious a fall in the price of the raw material the time is an opportune one for endeavouring to bring about special combination, and co-operation.

It was decided at the above meeting that a Committee be formed consisting of Mr. Lewton-Brain, Mr. E. B. Skinner and myself to go into the whole question with a view to adopting a scheme somewhat on the lines suggested in your letter.

As regards representation at the Congress and Exhibition it has been decided that the Director of Agriculture, Mr. Eaton, and one other Government Official be asked to attend. Three unofficials will also be asked to join the commission, though it is not possible to say at present who will be in a position to take the necessary leave at the time.

I am, etc.,
(Sgd.) R. W. Munro."

Mr. Munro appeals to estates to send exhibits, as the cost would be infinitesimal, and hopes that a great number of planters will visit the Congress. Special arrangements had been made and the trip could be done in ten days, which would allow six at the Congress.

Mr. Counsel proposes that a cup for rubber to be called the P. A. M. Cup, be awarded at the forthcoming Batavia Exhibition in such section as the Standing Committee of the P. A. M. shall decide.

Mr. Milne seconds the proposal which is carried.

Mr. Counsel further proposes that the value of this cup do not exceed £50 and that its cost be met from the recently started Exhibition Fund.

Mr. Jeavons seconds this proposal which is likewise carried.

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4. Repression of Drunkenness.

The Secretary reads correspondence dealing with this subject.

Mr. Ritchie believes a partial solution had been discovered in Negri Sembilan, where by a special arrangement with the Licensing Boards, estate Managers instead of boutique-keepers were now licensed; and reports that the system so far was working very well.

Mr. Dane is sure beer shops did as much harm as toddy shops.

Mr. Tayler agrees and fails to see any reason why the sale of beer should be free of any restriction.

Mr. Milne does not think Mr. Kellie Smith's figures at all exaggerated. He had often been along that road, and there were "literally hundreds" of drunken coolies rolling about, on any night. The sale of these horrible and poisonous mixtures ought certainly to be stopped, by means of putting shops under more efficient control and paying surprise visits, etc.

Mr. Jeavons says that near his estate there were no less than twelve small shops and of these ten sold beer, without, so far as he could see, any supervision. There has been an enormous amount of trouble lately, and he put it down to this beer, which presumably was adulterated.

Mr. Bennett believed there was a very useful beer coming out for the use of the coolie, called the "Revolver" brand. A coolie who had a dose of that and then some toddy was pretty well finished off.

Mr. Maude is of opinion that beer whether adulterated or not is intoxicating and bad for the coolie. He would therefore propose that beer be included in the definition of "Spirituous Liquors" in the Excise Enactments 1908/9 and that the Government be written to accordingly.

This is seconded by *Mr. Jeavons* and carried unanimosuly.

5. EDUCATION ON ESTATES.

The *Secretary* reports having obtained details of the system of education on Ceylon estates and that this includes the opening of estate schools in the afternoon.

He also reads the following correspondence, which is received by the meeting with applause:—

"Kuala Lumpur, 10th October, 1913."

"Controller of Labour, F. M. S.,
Kuala Lumpur."

"Sir,

I have the honour to acknowledge receipt of your letter 5/492 of August 30th re Education on Estates.

This matter was fully discussed at a Meeting of this Association held on the 5th inst., when it was resolved "that the Director of Education be asked to allow education on estates to continue for one year on the lines laid down in the Report of the P. A. M. Sub-Committee under date Oct. 21st 1912; that an examination be held towards the end of 1914 and that, where the results are satisfactory, the customary grants-in-aid be paid."

At the same time I was instructed to forward this Resolution to you and to invite your good offices in the matter."

"I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary."

"Kuala Lumpur,
Federated Malay States."
"6th December, 1913."

"Sir,

With further reference to your letter of July 10th, 1913, on the subject of the hours of attendance at schools for the children of Tamil labourers on Estates, I am directed to inform you that the Director of Education is being informed that as an experiment such schools should be opened for two hours only in the afternoon.

2. After this system has been given a year's trial the Director of Education will be invited to report as to the success or failure of the system."

"I have, etc.,
(Sgd.) W. Mackray,
for Ag. Under Secretary, F. M. S."

"The Chairman,
Planters' Association of Malaya,
Kuala Lumpur."

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6. Rural Boards.

The Secretary reads the following letter and report from the Hon'ble Mr. E. B. Skinner, which is adopted unanimously:

"Kuala Lumpur,
25, XI. 13."

"The Secretary,
The Planters' Association of Malaya."

"Dear Sir,

I beg to enclose you herewith a copy of the report of the Sub-Committee appointed to meet the Controller of Labour, with a view to deciding on what points in the Labour Code the Controller of Labour should consult with the Sub-Committees of the District Planters' Associations, before taking action.

The matter was fully gone into by Mr. Macfadyen and myself, with the Controller of Labour, before Mr. Macfadyen went home on leave. It was intended that Mr. Macfadyen should make a report on the results of our consultations, but owing to his early departure for Europe, he was so busy that he apparently had not sufficient time to make up the report. I have therefore drawn it up as requested by you and submitted it to the Controller of Labour, who has approved of the report. I now send you a copy, for the information of your Association."

"I am, etc.,
(Sgd.) E. B. Skinner."

"Report of a Sub-Committee Appointed to Meet the Controller of Labour, with a View to Deciding on what Points in the Labour Code the Controller of Labour should, in Practice, Consult with the Sub-Committees of the District Planters' Associations, Before Taking Action."

"The question was discussed with the Controller, at considerable length, by the Sub-Committee (Messrs. Macfadyen and Skinner), and it was decided that the principal points on which

friction might occur between the Labour Department and the planting community were the issuing of orders for making wells, brick drains, particular kinds of lines, etc. It was also found that Part VIII of the Code practically covered all contentious points which were likely to arise, so it was decided that for the time being, the following procedure should be adopted:—

1. PLANS. Plans of lines under Section 192 (ii) should be sent in the first instance to the Controller of Labour for approval as hitherto and if approved without amendment or with such amendments as might be agreed to by the employer, no reference to the Sub-Committee of the local District Planters' Association would be required. If however, the Controller found himself unable to assent to plans in the form finally submitted for approval, he was not to reject them definitely without reference to the said Sub-Committee.

2. ORDERS. The procedure to be followed is defined as follows:—

Before making an order under Part VIII of the Code involving the expenditure of money, the Controller will notify the employer or manager of his intention to do so, at the same time expressly giving him an opportunity of objecting to the order being made. If no objection is made within a fortnight, the order may be made and enforced, if necessary, by the Controller. In every case it must be made clear to the employer or Manager that he has a fortnight in which to lodge an objection, if there be any.

If however, an objection is received within a fortnight, the Controller will refer the matter for the consideration of the local Sub-Committee.

The above procedure is not at present to be applied to cases of emergency, but such cases will be reported at once to the Sub-Committee, and reasons given for taking action without consulting them."

"(Sgd.) E. B. Skinner,
24th November, 1913."

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7. ABSCONDERS.

The *Secretary* reads the following letters:—

"Kuala Lumpur, 10th October, 1913."

"The Hon'ble,
The Colonial Secretary,
SINGAPORE."

"Sir,

I have the honour to acknowledge the receipt of your letter 4473 of August 13th.

In reply I have the honour to draw your attention to the fact that the Government of Johore is apparently taking action in the matter, and to submit that under these conditions it would appear to this Association doubly desirable for your Government to take analogous steps."

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary."

"Colonial Secretary's Office,
Singapore, 7th November, 1913."

"Governor 5401/1913."

"Sir,

With reference to your letter of the 10th ultimo, I am directed to inform you that the return from the Colony of labourers absconding from employment in the Federated Malay States is governed by the "Straits Settlements Fugitive Offender's Ordinance, 1904."

2. The matter has received further consideration from the Governor in Council, but His Excellency is not prepared to recommend to the Secretary of State that the order above referred to should be amended in order to remove from a Magistrate the discretion given him in trial cases."

"I have, etc.,
(Sgd.) R. J. Wilkinson,
Colonial Secretary,
Straits Settlements."

"The Secretary,
Planters' Association of Malaya,
Kuala Lumpur."

"Kuala Lumpur,
Federated Malay States,
27th November, 1913."

"No. 7332/13."

"Sir,

I am directed to refer to your letter of the 22nd July, 1913, enquiring that steps be taken by the Government of this Peninsula to make "absconding" an extraditable offence.

2. Legal provision already exists under the Straits Settlements Fugitive Offenders Order of 1904—and the Federated Malay States 1904 Enactments entitled the Straits Settlements Offenders Enactment for the surrender of absconding labourers as between the Straits Settlements and Federated Malay States sub-

ject to the direction of the Magistrate in cases where the offence may appear to him to be of a trivial nature.

3. As between the Federated Malay States and the protected States of the Peninsula no legal provision exists at present for such surrender but when the general arrangements now under consideration as to the surrender of offenders in that area are made it is not anticipated that the offence of absconding from labour will be excepted from the application of the proposed legislation."

"I have, etc.,

(Sgd.) J. F. Owen,

Ag. Under Secretary, F. M. S."

"The Secretary,

The Planters' Association of Malaya,

Kuala Lumpur."

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8. Labour Code Amendments.

The *Secretary* reports on the amendments passed at the Federal Council held in November and reads the following correspondence:—

"Kuala Lumpur, 11th October, 1913."

"Controller of Labour, F. M. S.,

Kuala Lumpur."

"Sir,

Reverting to a discussion, which took place at a meeting of this Association held on the 5th inst., I have the honour to submit the desirability of amending 66 of the Labour Code by eliminating the words "on a place of employment."

"I have, etc.,

(Sgd.) H. C. E. Zacharias,

Secretary."

"Office of the Controller of Labour."

"No. 2 in 616/1913." "S. S. and F. M. S."

"Kuala Lumpur, 13th November, 1913."

"Sir,

With reference to your letter of the 11th ultimo submitting the desirability of the amending Section 66 of the Labour Code by eliminating the words "on a place of employment," I have the honour to inform you that the proposal was considered at a meeting of the Immigration Committee held on November 7th current and it was decided that sufficient grounds have not been advanced for recommending an alteration of the law.

I am not therefore prepared to move in the matter at present.

2. I am requested to say that should your Association desire the Immigration Committee to consider the matter any further

it is requested that fuller particulars may be given as to the number of estates employing Tamil labourers in numbers less than ten, and as to the actual difficulties arising out of existing conditions.

3. I have been informed since the meeting of the Immigration Committee that the Honourable Mr. E. B. Skinner (who was obliged to leave the meeting before the discussion of this item on the agenda) has embodied the proposed amendment to Section 66 in a private Bill amending the Labour Code which is to be submitted for consideration at the next meeting of the Federal Council."

"I have, etc.,
(Sgd.) E. S. Hose,
Ag. Controller of Labour, F. M. S."

Mr. Tayler considers that Section 66 decidedly wanted amending and if a strong case was to be made out, he would propose that all Constituent Associations be written to for information.

Mr. Jeavons certainly thinks that the minimum area should be reduced at least to 5 acres and seconds the proposal, which is carried.

"Office of the Controller of Labour,
S. S. and F. M. S.,
Kuala Lumpur, 15th November, 1913."

"Sir,

In continuation of my letter 2 in 618/1913 of the 21st ultimo on the subject of the suggestion that the local railway fares of Indian Immigrants should be defrayed by the Indian Immigration Committee, I have the honour to inform you that at a meeting of the Committee held on the 7th instant it was decided that the local fares by railway, steamer, or motor-bus of immigrants who have received assisted passages from India should be paid for out of the Immigration Fund with effect from the 1st January next.

2. It will probably be necessary to amend Section 161 of the Labour Code in order to enable the Committee to make disbursements from the Fund on this account.

3. It was further decided that the Committee will take over the work of landing immigrants at Port Swettenham, charging the cost to the Fund, with effect from the arrival of the first steamer leaving Madras on or after the 1st December next."

"I have, etc.,
(Sgd.) E. S. Hose,
Ag. Controller of Labour, F. M. S."

"The Secretary,
Planters' Association of Malaya,
Kuala Lumpur."

"Office of the Controller of Labour."
"No. 4 in 618/1913." "S. S. and F. M. S."
"Kuala Lumpur, 18th December, 1913."

"Sir,

With reference to my letter of even number dated the 15th ultimo on the subject of the landing, feeding and distributing of immigrants who have received free passages from India, I have the honour to inform you that Messrs. Boustead Hampshire and Company have agreed to the following reduced scale of agency charges in respect of such immigrants:—

A. Charges to be made if coolies are not distributed by the Agents, that is to say, if delivery is taken by the employer at the depot:—

Actual cost of feeding plus an agency fee of 20 cents per cooly. The agency fee to be reduced to 15 cents in any month in which more than 100 coolies are dealt with for one employer, and to 10 cents in any month in which more than 200 coolies are dealt with for one employer.

B. Charges to be made if the coolies are distributed by the agents to place of employment:—

As above, with an additional agency fee of 20 cents per cooly. This additional fee is to be reduced to 15 cents in any month in which more than 100 coolies are dealt with for one employer, and to 10 cents in any month in which more than 200 coolies are dealt with for one employer.

2. The new scale of fees, together with the arrangements for payment of local fares by the Immigration Committee, must await the passing of an amendment to the Tamil Immigration Fund Ordinance of the Straits Settlements enabling the Indian Immigration Committee to meet the proposed charges from the Fund.

3. Messrs. Boustead Hampshire and Company, while assenting to the proposed reduction of their agency fees, have pointed out to me that they suffer serious inconvenience from the delay in many cases in settling their accounts. They have quoted actual figures which show that there are reasonable grounds for complaint. I would therefore ask you to be good as to impress upon the members of your Association the importance of meeting the agents in this matter, especially in view of the very material modification in charges that have been secured.

4. Negotiations are being conducted with Messrs. Kennedy and Company of Penang with a view to obtaining similar reductions in their fees."

"I have, etc.,

(Sgd.) E. S. Hose,

Ag. Controller of Labour, F. M. S."

The Secretary also reports the opening of a Home for Decrepit Indians in Kuala Lumpur and lays official notice on table.

11. Javanese Labour.

The Secretary reads a letter received through Mr. Maude from the Labour Association, Ltd.

Mr. Maude suggests that the matter be referred to the Standing Committee and a move made. The firm in question said they could get over Javanese coolies at cheaper rates than planters in Sumatra could, probably for \$40—\$50 a head.

Mr. Milne seconds the proposal which is carried.

12. Newspaper Agitation.

The Secretary reports that he had approached the Chief Secretary F. M. S., as instructed, but that it had been found inadvisable to take any legal action.

Mr. Munro says that in accordance with the decision arrived at the last meeeting Mr. C. T. Ambikapat Rai had made his enquiry. He understood Mr. Rai had been very thorough in his enquiries and investigations from north to south of the Peninsula, and he believed he was right in saying that in hardly any case had he found anything whatever substantiating these statements. Of course there must be black sheep everywhere, and it was not to be expected he would find absolutely everything according as they would wish it to be, but he believed they would find he said that were there had been any question as to the want of proper handling of coolies it had mostly been amongst his own countrymen and not amongst the European employers of labour. The result of his enquiries should be very widely circulated, as a refutation, practically complete, of all those exceedingly unpleasant statements appearing in what was supposed to be a respectable publication, and he was glad to hear that it was shortly going to be published in pamphlet form and made accessible to a wide public.

13. Reduction of Wages.

The Secretary lays on table Minutes of Conference held on December 28th 1913 at Kuala Lumpur.

Mr. Cumming proposes that the Resolution passed at the Conference be adopted.

Mr. Maude seconds this motion, which is carried unanimously.

11. Licensing Rubber Dealers.

The Secretary reads the following correspondence:

"Kuala Lumpur, 17th November, 1913."

"The Under Secretary, F. M. S.,
Kuala Lumpur."

"Sir,

I have the honour to confirm my letter of June 24th on the subject of Licensing Rubber Dealers, and to enquire whether your Government is proposing to deal with this matter, as suggested."

"I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

"Kuala Lumpur,
Federated Malay States."

"No. 16 in 6237/1913."

"4th December, 1913."

"Sir,

With reference to your letters of the 25th June and of the 17th November, I am directed to inform you that the working of the Rubber Dealers' Enactment 1909 has been the subject of enquiry. Reference has been made to the Residents of all the States of the Federation but the Government has not been placed in possession of evidence to show that there is any necessity for a more stringent administration of the provision of this enactment.

2. It is on record that when the Enactment was passed in 1909 it was not the intention of the Government to appoint a special staff to administer it as it was considered that the existing staff of the land and District Offices was sufficient for the purpose.

3. Since that time there have been appointed Agricultural Inspectors in Perak, Selangor, Negri Sembilan and Pahang, who have statutory powers of inspection under the Enactment and instructions have been given to those officers to inspect the books of accounts of licensed dealers or owners and treaters of rubber.

4. It is also proposed that the names and addresses of licensed dealers shall be published in the Gazette.

5. The Government is not prepared to assent to the suggestion that a special branch of the Customs Department should be formed or that special European Inspectors should be appointed under the Enactment, nor is it considered necessary to introduce a system on the lines of the Licensing Justices of the Excise Department as suggested for dealing with applications for licences."

"I have, etc.,
(Sgd.) J. F. Owen,
Ag. Under Secretary, F. M. S."

15. Agricultural Department.

The *Secretary* reads the following correspondence:—

"Kuala Lumpur, 14th October, 1913."

"The Hon'ble,
The Colonial Secretary,
Singapore."

"Sir,

I have the honour to refer you to a letter written by the Malacca Planters' Association under date Oct. 1st 1913, to the Resident of Malacca on the importance of rendering the services of the Agricultural Department of the Federated Malay States available for the Colony.

The original resolution to this effect passed by the Malacca Planters' Association was brought forward at the last meeting of this Association held on the 5th inst., when I was instructed to inform you that this Association fully endorses the views of the Malacca Planters' Association on this subject."

"I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary."

"Malacca 5865/1913."

"Colonial Secretary's Office,
Singapore, 21st October, 1913."

"Sir,

I am directed to acknowledge the receipt of your letter of 14th October current, relating to the proposal that the services of the Federated Malay States Agricultural Department, should be rendered available for the Colony, and to inform you that the matter is receiving attention."

"I have, etc.,
(Sgd.) S. W. Arthur,
for Colonial Secretary,
Straits Settlements."

"The Secretary,
The Planters' Association of Malaya,
Kuala Lumpur."

16. Marketing of Rubber.

The *Secretary* reads the following letter:—

"The Manhattan Rubber Mfg. Co., of New York."

"New York, December 12th, 1913."

"Secretary,
Planters' Association,
Kuala Lumpur, F. M. S."

"Dear Sir,

We are quite large purchasers of Plantation Rubbers from time to time and have found considerable difficulty in the fact that when we make a contract for say five (5) tons First Latex Hevea Brasiliensis Plantation Rubber that when the rubber is received by us it apparently came from half a dozen different Estates, and when we make tests of these different lots the variations are quite considerable, so much so that we are not able to use Rubbers from different estates for the same purpose, and this of course complicates matters for us in our manufacturing Department.

The purpose of this letter is to ascertain if I possibly can from you how we can purchase rubber directly from some of the Standard Estates in your part of the world and have the Rubber shipped direct to us in New York and not be subject to the possibility of having a lot of Rubber sent us which would come from several different estates, or possibly from two or three different countries. In other words, we would prefer to do business with principals direct, rather than through London Brokers.

If you can put us in communication with reliable estates who are in a position to market their rubber direct we would appreciate it very much. We of course in turn would establish such credits, or make such financial arrangements as would be entirely satisfactory to people in your part of the world.

Thanking you in advance for your kind attention to this matter,

Very truly yours,
(Sgd.)
President,
The Manhattan Rubber Mfg. Company."

Mr. Munro draws attention to the importance of this letter, which ought to be given the widest possible publicity. It was quite clear that the interests of the Rubber Industry lay in direct dealings between producer and consumer.

Mr. Maude quite agrees and would like the letter to be brought to the notice of all shareholders in England. At present the influence of a small clique of agents and brokers, with vested in-

terests in London, stood between them and the manufacturers, but the real owners *i.e.* the shareholders, were beginning to wake up to these facts. He would like copies of the letter from the Manhattan Co. to be sent to all the London Financial papers, the "Daily Mail," the Rubber Growers' Association, etc. Personally, he was convinced that the best market for Plantation Rubber from Malaya was Singapore and that it was the market of the future for this produce.

17. L. C. Brown, Testimonial.

The *Secretary* reports progress made in collecting subscription.

Mr. Munro says he had taken it upon himself to purchase a silver bowl, suitably inscribed, and he hoped the form of the gift chosen by him would recommend itself to members.

The bowl is placed on Table and the action of Mr. Munro agreed to.

18. Lower Perak.

Mr. Counsel wishes to propose a motion on the subject of the Standing Committee and says that Bagan Datoh had suffered for longer than they cared to remember, from the most tremendous drainage and other disabilities. In August last matters came to a head, and the position was a very grave one, so grave that it was apparent that, if something drastic were not done at once, at least fifteen thousand acres of the finest coconut land in the country, many under cultivation, would have been very seriously damaged, probably wiped out altogether. They were young and struggling, unknown and far out of the way, the only thing to do was to go to the fountain head, the Chief Secretary, at once, and tell him if $172,000 were not spent very quickly they could not carry on. The then Chairman of their Association very properly suggested that as they were only a part of the P. A. M. it was right and courteous that they should approach Government through the parent body. Accordingly in August they wrote asking that they be allowed to meet the Standing Committee. They were told the next meeting of the P. A. M. would be held in October and, following that, one in Telük Anson in December. It was impossible however, to wait, even for the October meeting, so they took action themselves. The Chief Secretary came down, and they got more than they wanted, and given in the most charming and courteous way.

Now that was very nice and creditable to the Bagan Datoh D. P. A. but it was clear to him and to his friends that the right of every constituent association to the assistance of the Parent body

badly wanted re-affirming. He did not wish to enlarge on the point, but would himself propose:—

"That this meeting affirms the inherent right of any District Association in matters of special urgency to approach the Standing Committee of the P. A. M. as a deputation through their duly appointed delegates to lay such urgent matters before the Standing Committee with a view to obtaining the immediate help and influence of the P. A. M. in any way found to be advisable."

The motion, having been seconded by Mr. Davidson, is carried without discussion.

19. General.

The Secretary lays on the Table Circular re Third International Congress of Tropical Agriculture (London, 1914) and particulars of Carnauba Wax Palm.

The Meeting terminates at 12.30 p.m.

H. C. E. Zacharias,
Secretary.

RUBBER GROWERS' ASSOCIATION.

Report of Standardization Committee.

The report of the Standardization Committee, to the Council of the Rubber Growers' Association, appointed to consider a scheme for a more accurate system of standardization and valuation of Plantation rubber and for extending the use of Plantation rubber which has been received recently is a very instructive document and shews the interest which is being taken in this important subject by those directly interested in plantation Para rubber, and by manufacturers and leading rubber technologists.

The following review of the report gives a digest of the evidence submitted and a criticism of the proposals, particularly with reference to the scheme inaugurated at the Agricultural Department.

The report is divided into seven parts as follows:—

1. Report on standardization of other products, such as wool, coal and wheat.
2. Reports on estimate of cost of proposed testing station and factory.
3. Conference of manufacturers and technologists.
4. Report on the nomenclature of crude rubbers.
5. Report on the testing scheme.
6. Draft specimen of certificate.

7. Circular for distribution among Estate Managers re methods of coagulation and treatment of latex, etc.

Sections 1, 2, 4, 5, and 6 do not materially affect the general idea, and are of less importance and interest to planters in comparison with the other sections.

Standardization of other Products.

With reference to Section 1 it is generally well-known by this time that a large number of products are tested by chemical, physical or mechanical methods based on scientific experiments, and sold on the basis of certificates; the idea of selling raw rubber on a similar basis is merely an adaptation of old methods to a new industry, except in so far, as the tests to be adopted are concerned, since these have no exact counterpart in the case of other products and the methods of testing even are in a state of evolution.

Estimate of Testing Station, Etc.

The estimates prepared by Dr. Schridowitz, one of the leading consulting chemists in London who has been engaged in rubber work for some years, are of interest locally only in so far as they give an idea of the extent of the scheme. Thus the smallest scheme proposed deals with 10,000 tons of raw rubber per year and since it is proposed to sample each ½ ton or say 10 cases of rubber, this means the testing of about 20,000 samples per year or between 60 and 70 samples per day. This would mean a large number of mixing machines and vulcanising pans, and other machines such as calenders on a smaller scale. A mixing may occupy half an hour or longer, and assuming an eight hour day as suggested, this would mean a maximum of 16 samples on one machine and would probably be considerably less, so that 5 to 6 of such machines would be required.

With the present plant at the Agricultural Department, F. M. S., it would not be possible to do more than 16 samples per day and the actual number in this climate and working under local conditions would probably not exceed half this number. This part of the subject will be discussed later.

Nomenclature of Plantation Rubber.

Section 4 on nomenclature contains a letter by Mr. Cyril Baxendale and gives the results arrived at by a Committee appointed by the Executive Committee of the International Rubber Conference held in New York in 1912. This Committee suggested the adoption of various commercial terms for Eastern Plantation rubber indicating its nature, botanical source and country of origin.

Certificate of Quality.

Section 6 as its title indicates, gives a draft certificate indicating the results obtained by the various tests applied, and giving an index figure of quality for each sample, enabling any manufacturer to compare the sample with others giving similar results, once such figures had been correlated with works' practice.

Report on Tests.

Section 5 contains a report by Mr. Burgess (late Govt. Analyst S. S.) on the tests suggested by Dr. Schridowitz in which he agrees that the tests proposed are scientifically sound and likely to be of value. Other evidence to this effect is given under Section 3.

Conference of Manufacturers, Etc.

This section dealing with the evidence given by manufacturers, leading rubber technologists, etc., on the quality and variation of plantation rubber, on the value of the proposed testing scheme and the soundness of the tests suggested, is of great interest.

Manufacturers' opinions on the variation of plantation rubber, the futility of the present method of buying on "hand-pulling" tests, etc., are ample confirmation of views expressed previously in by the writer and others. This evidence may be summarised briefly as follows:—

1. Plantation rubber varies considerably in quality and the variations are greater than those found in different samples of "Fine Hard Para." This opinion was expressed generally and is based on tests as well as on works' experience. There is considerable variation especially in smoked sheet.

2. Grading of Plantation rubber needs consideration.

3. Present method of judging raw rubber by brokers, etc., of no value, as two samples, apparently the same, behave quite differently on vulcanisation.

4. Variability affects the whole market for plantation rubber, as it tends to lower the market value of even the highest grades.

5. Variability the real cause of manufacturers' dislike of plantation rubber compared with Fine Hard Para. Manufacturers would use more if they could rely on a more standard material.

6. An absolutely standard material not possible owing to variation in latex, etc., but the tests proposed would differentiate the samples.

(*N. B.* Fine Hard Para means only the highest quality of S. American smoke cured rubber previously graded.)

7. The scheme of valuation and testing proposed is considered sound and manufacturers state that after trial they would be prepared to buy on certificate.

One interesting point brought to light at this conference was the fact that large manufacturers with testing laboratories at the factory were able to buy raw rubbers considered inferior by buyers, at a cheap rate, whereas the small manufacturer would have no means of knowing the quality of the rubber purchased except by the bitter and costly experience of a spoilt batch in manufacture, so that the proposed scheme would be of great value to those factories having no testing department.

Circular for Estates.

This circular contains nothing new as far as methods of coagulation and subsequent treatment of raw rubber in the estate factory is concerned, but lays down certain methods which should be adopted by all well managed estate factories. Unfortunately in this country, this important part of the work is often very badly supervised and the coagulation, etc., is done entirely by natives, with little or no European supervision.

Remarks.

The recommendations of the Committee are to the effect that a testing station and experimental factory should be started on the lines of Dr. Schridowitz's report, such station to issue certificates of quality of the samples tested. To carry out these recommendations it is suggested that a Company be formed in which the different rubber companies should become shareholders.

There is no doubt in my opinion that the scheme proposed is excellent in principle, but is probably somewhat premature, as more experimental work is required in connection with methods of preparation of the raw material. It will undoubtedly however place a real value on plantation rubber from any particular estate and tend to raise the market value of such plantation rubber which is at present sold at a price not commensurate with its real quality. At the same time, estates whose rubber obtains a low index figure of quality will know that something is wrong with the methods of preparation, and will be able to improve these accordingly.

With the present methods of judging, it is practically impossible in many cases to remedy so-called defects, as these often exist only in the imagination of the buyer. The general opinion is that the proposed scheme will tend to raise the market value of most of the First Quality Plantation rubber and, with this opinion, I think those who have any knowledge of the subject will agree.

It may be thought that this scheme will have the effect of modifying that already adopted by the Agricultural Department, but while this may or may not be the case as far as the future development and ultimate idea of our scheme is concerned, *i.e.*, the formation of a testing station for Malaya, at which certificates of quality of all estate rubber could be issued on lines similar to those laid down in the R. G. A. report (Vide Agri. Bull. Vol. I, No. 10, p. 348) the original idea which will need no modification, was a scheme of testing for research purposes, in order to test plantation rubbers from trees of different ages, under different tapping conditions, etc., and prepared by different methods of coagulation machining and curing or drying with a view to evolving a method of preparing a raw rubber equal to or better than Fine Hard Para. This scheme was inaugurated on account of the fact that there are no satisfactory methods of testing raw rubber, and because market values gave no idea as to the real quality of any sample; after about six months preliminary work on coagulation methods, etc., it was realized that tests carried out on vulcanised rubber were the only real criterion of quality.

There is a vast amount of work to be done in this direction alone, quite distinct from the larger scheme of a testing station. Apart from the commercial value of such work, the scientific worker is not satisfied until the underlying causes producing the results obtained, are ascertained, that is to say in this case, we want to ascertain the actual cause of differences in quality, and to trace it to any one or more factors.

In the R. G. A. scheme it is suggested that a testing station would be preferable in England to one in the country in which the rubber is produced, owing to changes which may occur in the rubber during transit. I do not think this statement has much foundation in fact, as far as deterioration is concerned. Any obvious damage caused by sea water, etc., would easily be discovered and the question of temperature in the hold of a ship—away from boilers or other artificial source of heat, is probably negligible in the case of rubber from the tropics. This is a point however that could easily be tested. In the event of Singapore becoming the centre of a large rubber auction, as appears probable, a testing station in Malaya would be of great importance, apart from any such station in England, and the present plant at the Agricultural Department would form an excellent nucleus for this purpose.

With regard to the nature of the proposed tests, very little information is disclosed. The criticism by Dr. Stevens is of interest as he shows the time occupied in carrying out the work and indicates the necessity of allowing the vulcanised rubber to rest before the tests for tensile strengths, etc., are applied. His re-

marks with reference to the behaviour of the rubber in the mixing rolls are also of interest. It is generally understood however that the more difficult a sample of rubber is to "break down" in the mixing rollers, the higher its quality.

B. J. E.

LOCUST WORK IN DECEMBER.

By F. de la Mare Norris.

Contrary to expectations, locust work in Selangor during the month of December continued to be of a purely non-destructive nature; it was anticipated that the breeding season would be in full swing, but for some reason, possibly depending on the amount of rain which fell during the month, no breeding has taken place. Swarms continue to decrease in number, though some have increased in size, pointing to the fact that they are joining forces.

The conductors have as before been stationed in the various districts throughout the State, and have kept the flying swarms under observation. One swarm flew off in a northerly direction and reached Kerling. It was however small and has practically ceased to exist, an inspection of the district early this month revealing only a few solitary locusts.

As anticipated, the large swarms from Rasa, which moved in an easterly direction far into the Bukit Kutu Forest Reserve in October, reached Pahang, and a report of fliers came from Bentong. A conductor was sent to investigate, and three contingents of the swarm were located. The swarm had suffered considerably during its journey and was in a very poor condition. Further inspection has shown that it has been dying out rapidly, and it is doubtful if it will ever give rise to another generation. Precautions have been taken to keep the remnant under observation, but it is thought that there is very little to fear from this direction.

In Negri Sembilan the destruction work went steadily forward, and towards the end of the month the Seremban, Tampin and Kuala Pilah districts were practically free from hoppers.

The catch throughout the State for the month was approximately 1500 tins, representing about 400 swarms. During the month experiments with various poisons were carried out in this State by the Government Entomologist, and some very favourable results were obtained. It is hoped in dealing with the next generation of hoppers partially to supplant the bag-trap system by the use of poisons.

NOTES ON INDIGO PLANTING IN MALAYA.

By F. G. Spring.

A considerable amount of interest was evinced on this subject after an address to a gathering of planters and others at the Department of Agriculture, Kuala Lumpur, in July 1912. It was evident at this meeting that those present were rightly sceptical as to the growing of this product until it had been tried experimentally in Malaya and in consequence of which it was decided to cultivate a few of the better varieties of Indigo at Kuala Lumpur Experimental Plantation.

Indigofera arrecta, which is considered one of the best varieties, was grown as a subsidiary crop to young coconuts and rubber, the former area covering roughly four acres and the latter about two. The land on which the tests were made was undulating, of a laterite nature, in good condition as regards tilth and entirely free from lalang and other noxious weeds at the commencement.

The ground was forked to a depth of about 6 inches and the surface soil reduced to a state of five division previous to sowing. The seed was then broadcast as recommended in four directions, at the rate of 42 lbs. to the acre. The writer's experience is that this quality is excessive, 10 lbs. being ample if good quality seed is obtained. Too heavy sowing is expensive and unnecessary when it is remembered that the ultimate distance of the plants is about 3 feet apart each way, there is also a danger of the seedlings being overcrowded which would retard growth.

When possible drill sowing would appear to be preferable to broadcasting.

The growth and health of the Indigo at the commencement was quite good and the first crop of seed was fairly satisfactory. After the collection of seed the plants were cut to a height of about 8 inches from the ground and the stumps threw out new shoots and attained a height of from 3 to 4 feet in about 2½ months. It was at this stage that the plant proved itself most susceptible to the ravages of the caterpillars of a moth. The plants were entirely stripped of their leaves and as soon as new shoots appeared they were readily devoured, the ultimate result, in almost every case, was the entire destruction of the plant.

Indigofera sumatrana, was grown on a smaller scale but with similar results.

Indigofera Aril was sown in nursery beds, the percentage germination of seed was good, and the seedlings grew well until they attained a height of about 4 inches when it appeared to be attacked in a similar way.

Indigofera hirsuta which was also grown on a small scale, did remarkably well until the period of seeding when it was also noted to be attacked by this insect. To test whether this caterpillar was a pest to other plants in general or confined itself principally to Indigo the varieties *arrecta* and *sumatrana*, were grown in nursery beds surrounded by a varied selection of plants including many of the Leguminosæ, the same order of plants as Indigo. Without an exception all the Indigo plants were attacked but in no case could any damage be found done to the surrounding foliage.

At Castleton Estate, Teluk Anson, better results were obtained. The soil here is of an alluvial nature of a heavy type. The mode of cultivation, there was changkolling and harrowing, the seed being afterwards drill sown.

The *I. sumatrana* gave good percentage germination of seed and the growth as regards branch and leaf development was all that could be desired.

In the case of *I. arrecta* the germination of seed was good but the growth of the young plants was irregular. Both varieties were entirely free from insect attacks. Two cuttings could easily be obtained in a year and under good conditions probably three.

Indigofera Aril and *hirsuta* were both grown on a small scale at Teluk Anson, but did not prove satisfactory, they were however quite free from insect attacks.

It is probable that the ravages of this pest would be most serious in those lands which have been under Indigo for several years in succession. Considering that this product has not been grown in the Kuala Lumpur district before and bearing in mind the destruction done to the first crop, I am afraid that its successful cultivation in this locality appears none too hopeful. It is also probable that if the cultivated area extends the more prevalent will the pest become. I have no doubt that good crops may be grown but there is always the possibility of it turning out a failure depending to a large extent on the presence or absence of the insect attack referred to.

So far the results as a whole have not proved satisfactory and at present it is not deemed advisable to recommend its cultivation in Malaya.

Further trials are to be made and will be reported on later and if it should prove more successful than this, the first trial, the weights of green cutting per acre and its value as a green manure will then be given.

DEPARTMENT NOTES.

Mr. F. T. Brooks, Mycologist, Department of Agriculture, F. M. S. arrived at Kuala Lumpur and assumed his duties on 3rd January, 1914 (Vide A. B. Vol. II, No. 5, p. 140).

Mr. H. H. Stirrup, Assistant Agricultural Inspector, Department of Agriculture, F. M. S., arrived at Kuala Lumpur and assumed his duties on 17th January 1914 (Vide A. B. Vol. II, No. 5, p. 140).

Mr. J. R. Hill, Chemist, Institute for Medical Research, F. M. S. has been transferred, to the Department of Agriculture, F. M. S. as Assistant Agricultural Chemist.

ULU SELANGOR DISTRICT PLANTER'S ASSOCIATION.

A general meeting of the above association was held in the Rest House at Kuala Kubu at 9.30 on December 14th. The following were present:—

Messrs. W. de L. Brooke (chairman), E. Granville Smith (Hon. Sec.), F. W. Davis, A. P. Mackilligin, M. J. Kennaway, F. M. Campbell, L. W. Weddige, F. G. Herose, R. M. Newton and W. A. Henderson.

1. The minutes of the previous meeting were read and confirmed.

2. The Chairman expressed his regret at the resignation of Mr. Granville Smith as Hon. Secretary and referred to the hard work he had done for the association and his estate. He proposed a hearty vote of thanks to Mr. Smith coupled with an expression of their best wishes for his future. Seconded by Mr. Henderson and carried unanimously. Mr. Smith suitably replied.

3. On the proposition of Mr. Newton seconded by Mr. Kennaway, Mr. Henderson was elected Hon. Secretary. The Chairman was appointed a delegate to the P. A. M. conference on cooly wages in place of Mr. Smith.

4. The Chairman said that they could congratulate themselves on the favourable reply from Government on the matter of telephones. Their thanks were due to Mr. Granville Smith for the extra work it had entailed, and to the Hon. Mr. E. B. Skinner for the help he gave in the matter.

5. The secretary read several letters which had been received on the matter of reduction of cooly wages. The Chairman said that before they came to their decision to reduce wages they all knew that the P. A. M. conference was coming off; but after carefully considering the matter they felt they could stand the reduction fixed on. After further discussion it was resolved to hold a meeting immediately after the P. A. M. conference.

Mr. Mackilligin proposed and Mr. Campbell seconded that "Managers should come to D. P. A. meetings with authority to act in the matter of cooly wages."

Mr. Smith proposed as an amendment that the words "in the matter of cooly wages" should be changed to "in all matters" but this was not seconded.

Mr. Mackilligin's proposition was carried.

The subject of cooly recruiting rates was postponed till next meeting.

The proceedings terminated with a vote of thanks to the Chair.

PAPAIN, ITS PRODUCTION AND USES.

The following article, abstracted from the *Indian Trade Journal,* has been sent by Mr. W. P. Hume, Commissioner of Trade and Customs, F. M. S.

Apart from the variation and adulteration of this drug referred to in the abstract, it would appear that much of the so-called papain on the market consists of pepsin, another enzyme or unorganized ferment, having a digestive action on proteid matter.

The question of the cultivation of the papaya tree for extraction of papain will probably be considered later on, as it may be, at any rate, a useful product to cultivate on a small scale.

Mr. Charles K. Moser, the United States Consul at Colombo, has been at some pains to collect reliable information about the production and uses of papain—the most important chemical constituent of the papaya fruit—and in a note recently published by the Department of Commerce at Washington he gives a number of interesting facts. The *Carica papaya* is very commonly cultivated in gardens throughout India and in localities more or less naturalised. It grows largely also in Ceylon, the East and West Indies, and the Hawaiian Islands. The tree attains a height of 20 to 30 feet, and its fruit resembles a small muskmelon in size, shape, and appearance. The fruit is green when unripe, greenish yellow when ripe, with rich yellow flesh, and contains in its hollow interior hundreds of small, round black seeds with a flavour somewhat like nasturtium seeds. From the fresh milky juice that exudes from both the fruit and the tree itself papain is obtained.

There are several varieties of *Carica papaya,* and the papain derived from the different kinds varies accordingly, the best being obtained from the male trees of the Ceylon hybrid papaya. The papain obtained from the West Indian variety is said to be inferior.

The digestive and disintegrating properties of papain are remarkable. The milk and even the fresh leaves of the papaya tree are said to render the toughest beef tender in the space of

two hours. Mr. Moser states that native cooks invariably wrap tough raw beef with the fresh leaves for half an hour, or apply a small quantity of the fresh milk directly to its surface, or put a piece of the green fruit into a raw curry when the beef will not boil soft. If a large quantity of the juice is applied to the raw beef it reduces it in little over half an hour to a pulpy mass that appears as if it had undergone partial digestion. Papain is said to be capable of digesting ten to twelve times its weight of egg albumen at the temperautre of the human body.

There are many other uses for papain. Taken as a tabloid or in the form of raw fruit, it acts gently but effectively upon the liver and bowels. It is also said to remove freckles and is frequently used by the natives of Ceylon as a soap. From its power to remove stains in clothes, papain is called "melon bleach" by the Singhalese, and they use it in the water when washing coloured clothes, especially black, which it seems to intensify. In the Antilles it is used as a cosmetic and produces clear. satiny complexions.

Commercial papain, or the crude drug, is a brownish, gummy substance looking like coarse bran or irregular granules of gum arabic. In Ceylon it is prepared by treating the juice of the fruit with rectified spirits and either drying in the sun or evaporating in dry-air chambers. The age, sex, and variety of the tree are important in determining the quality of the dried preparation. Papain is insoluble in water, coagulates when heated to 175° F. or when exposed long to air, and has an acrid taste and acid reaction.

According to a Ceylon authority (Dr. H. Huybertsz), commercial papain is prepared in granules and powdered forms. The natural colour of the former is a light brown, which becomes darker when exposed to the air for any length of time. Powdered papain is of a light biscuit colour, which does not change on exposure to air; a darker-coloured powdered papain indicates adulteration or improper preparation. Dr. Huybertsz states that European and American importers object to papain in its natural colour and insist that it be white or at least light. This, he says, is a great mistake, as it can only be obtained by bleaching, a process which sacrifices therapeutic efficacy for pharmaceutical appearance.

The taste of papain is slightly saltish and somewhat acrid. It has a peculiar, unmistakable smell, and the "feel" of granular papain should be crisp like biscuit and easily crushed between the fingers. When it is doughy or sticky it has been adulterated or badly prepared. It also has slight caustic action, and collectors of the fresh juice have the skin of their finger tips blistered. When

mixed with water it has a soapy feel. Its adulterations are many and often difficult to detect, and range from dough and bread crumbs coated with the fresh juice and dried, to the addition of gutta-percha and wild cactus milk. Dr. Huybertsz quotes as follows from a medical journal:—

At present a crude material prepared by natives, and containing abundant adulteration, is purchased cheaply by local firms, who export it as papain or papaya juice. Its preparation is primitive, and consists only of drying in the sun or over a smoky fire, and of thickening by the addition of starchy matter, such as rice, congee, bread, flour, arrowroot, biscuits, etc. Recently the native has resorted to the use of a dangerous adulterative material, *viz.*, the milk from the gutta-percha and wild cactus. The latter has irritant properties, acting as a caustic. The comparative failure of papain as a therapeutic agent is undoubtedly explained in part by the sophistication to which it has been subjected.

Up to a comparatively few years ago the value of papain was little understood and it was mostly used in making mucilaginous products. Since then the United States, Germany, and England have imported considerable quantities. However, the exports of papain from Ceylon to the United States amounted to only about Rs. 4,000 in 1911 and Rs. 13,000 in 1912. Mr. Moser is of the opinion that the smallness of the export trade is due to the fact that American importers prefer the inferior qualities from the West Indies; also they desire a white or bleached papain, which the Ceylon native is not always in a position to supply. American importers could, he thinks, procure, without much difficulty, an almost unlimited supply of the best unadulterated Ceylon papain if they were willing to pay a slightly better price for it than for the West Indies product and would accept it in its natural state. The price of crude papain in the London market some fifteen years ago was approximately 18*s.* 9*d.* per pound; now the price for medium first quality is said to be about 8*s.* in London and 8*s.* 9*d.* ($2.10) in New York.

The writer of the report makes no mention of the fact that the juice of the unripe papaya fruit is efficacious in the treatment of certain skin diseases. **B. J. E.**

NOTE ON THE RAT AS A COCONUT PEST.

By H. C. Pratt.

The position of priority as a really serious pest to young coconuts in the Malay States must be given to rats. They have caused immense damage in several districts, completely destroying as much as 2000 acres in one locality. They are not constant in their attack. At certain times of the year they invade young fields

in immense numbers and working at night nibble the base of the trees, eventually eating out the heart, leaving a hole about 2½ inches in diameter. The young plant naturally dies. Several remedies were tried and that which is the most satisfactory is the protection of each individual tree. Originally the expense of this method was its one drawback. With kerosene tins it would cost $17 per acre. With sheets of zinc the cost was reduced to about $12 per acre. Several designs were tried in order to reduce the cost and it is now possible to prevent the ravages of this destructive animal at a total cost of $5 per acre. Considering the immense damage which rats cause this may be regarded as a nominal cost, although it may be possible still further to reduce it. All estates having young coconuts, *i.e.,* those recently planted out, and where rats have previously demonstrated their ability to devastate large tracts of land should as a matter of insurance be prepared to spend this amount on protecting their recently planted areas. It is quite apparent that non protected areas in some districts are very liable to be destroyed and should this happen the loss involved includes the following:—

1 year lost.
1 year's weeding.
Re-lining.
Re-planting.
Purchase of nuts.

The following method for the protection of young trees will prove satisfactory. Out of a piece of zinc 18″ long and 12″ wide an arch is cut at the middle of the longer edge, measuring approximately 7″ wide at the base, and 5″ high.

The nut itself fits into this arch and by drawing the tin round the tree a cylinder about 5 inches in diameter is formed enclosing the young tree which practically fills the cylinder. The base of the cylinder on either side of the arch is buried about 3″ in the ground thus enabling the top of the arch to fit tightly over the upper part of the nut. No rat can harm a young plant protected in this way, for if access is obtained by burrowing there is no room for the rat to work within the enclosure.

Older trees can be dealt with more easily and by the cheaper system of attaching a ring of tin to the trunk with the upper edge turned down. It would not be feasible, on account of expense to enclose older trees. Although it is probable that where the rats are in excessive numbers no trees would be really immune there can be no doubt that it is the younger ones, in fact those recently planted, that require guards. After they are a year old they are not at present often damaged and the guards above described will protect them for this necessary period,

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1913 and 1912.

Destination.	Exported during Dec. 1913.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1913.	Duty collected, 1913, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,226.54	9,714.69	10,941.23	6,595.68	4,345.55	...	25,877,767	642,182.71
United Kingdom ...	1,138.32	9,367.42	10,505.74	7,466.80	3,038.94	...	25,808,869	645,221.72
Continent of Europe ...	180.65	1,220.37	1,401.02	1,029.73	371.29	...	3,442,696	86,067.40
Ceylon	70.30	547.55	617.85	402.88	214.97	...	1,534,627	38,365.67
Other Countries ...	...	...	...	10.45	...	10.45	...	...
Total ...	2,615.81	20,850.03	23,465.84	15,505.54	7,970.75	10.45	56,663,959	1,411,837.50*

* Figures obtained by wire and subject to rectification.

KUALA LUMPUR,
7th January, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of December, 1913.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	143.	79.4	85.74	73.32	12.42	74.5	.761	71.1	.75%	...	23.45	3.17
Malacca, Durian Daun Hos.	29.900	149.6	81.3	86.	71.6	14 4	78.5	.930	...	.87	N.	2.74	.64
N. Sembilan, Dist. Hospital Seremban	...	148.5	78.2	88.9	71.5	17.4	75.3	.821	73.3	.85	N. W.	15.97	3.33
,, Dist. Hos. K. Pilah	...	154.7	79.5	86.1	73.5	12.6	77.6	.909	76.3	.89	...	8.01	1.20
,, ,, Tampin	...	138.3	80.1	...	...	...	75.8	.816	73.0	.79	...	7.07	1.01
,, ,, P. Dickson	...	156.1	80.8	86.9	73.4	13.5	76.9	.853	74.2	.80	...	10.06	1.98
Pahang, ,, K. Lipis	...	...	78.9	87.3	70.5	16.8	74.8	...	...	...	...	11.79	1.40
Penang, ,, Penang	29.849	138.3	81.1	87.5	73.1	14.4	76.6	.812	73.2	79.6	...	4.62	1.00
Perak, ,, Taiping	...	104.	80.34	93.	68.	25.	76.39	.857	...	.85	...	23.01	4.34
,, ,, Ipoh	...	...	81.10	92.	70.	22.	76.50	.852	...	.80	...	13.91	3.42
,, ,, T. Anson	...	...	81.39	90.	70.	20.	77.70	.902	...	.85	...	10.28	2.00
,, ,, P. Buntar	...	...	80.75	89.	71.	18.	76.60	.862	...	.82	...	7.68	2.60
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	16.58	2.63
Selangor, General Hospital Kuala Lumpur	...	120.4	80.4	88.4	77.5	10 9	77.1	.865	74.8	.83		11.43	2.85
,, Dist. Hos. Klang	...	...	79.2	86.	72.	14.	76.	...	...	...	...	10.69	2.55
,, ,, K. Selangor	...	...	...	88.4	75.4	13.	...	...	...	...	...	11.04	2.16
,, ,, Rawang	...	...	...	90.7	71.7	19.	...	...	...	...	...	12.07	2.09
Singapore, Kandang Kerbau Observatory	29.928	167.	80.7	91.5	71.8	19.7	77.	.842	...	.84	N. E.	11.73	4.29

THE

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OF THE

FEDERATED MALAY STATES.

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MR. L. C. BROWN.

On January 31st, 1914, Mr. L. C. Brown, Inspector of Coconuts in the Department of Agriculture, F. M. S., retired from Government service. Mr. Brown was appointed Federal Inspector of Coconuts in 1902, a post for which his long acquaintance with Malayan agriculture and agriculturists well qualified him. The formation of a Department of Agriculture, F. M. S., did not take place until 1905, and Mr. Brown's inspection division was afterwards incorporated in the Department. At the close of his service he was assisted by two Assistant Inspectors and nineteen Sub-Inspectors.

Very few people have been long enough in the country to realize from personal experience and observation the value of Mr. Brown's services to coconut cultivation. When he started his work coconut pests were increasing to an alarming extent and it was difficult to find a native holding free from them, and very little attention was paid to their control; European planters were naturally alarmed at the spread of the pests and were put to considerable trouble and expense in keeping their own places free. Now it can, I think, be said that Coconuts in Malaya are remarkably free from pests and when these do occur, their treatment is taken in hand at once.

The methods by which Mr. Brown has brought about this change are well stated in a letter dated October 7th, 1902, addressed to the Chairman, United Planters' Association. "I would ask your Association kindly to co-operate with me in the work and assist me in making the best progress possible. In the coconut plantations, and this applies more particularly to native holdings where the ravages of the beetles are worst, it will I fear be necessary to take very stringent measures, but I would prefer using most pressure by persuasive means, pointing out to owners and tenants alike how much it is to their own advantage if they will themselves help in getting rid of these pests."

The report of the United Planters' Association for 1903 states that already " on all sides it is admitted that an immense amount of good has been done by the Department which has been entrusted with the working of the ordinance for the protection of Coconut trees. It has no doubt been a comparatively easy matter for the Inspector to see that European Estates are kept in order, but this cannot have been the case with native cultivations. An immense area has to be traversed and carefully inspected, and the often careless and lazy owners persuaded that it is to their best advantage that their trees should be not only cleared but kept clear of the destructive insects, whose presence spells ruin not only to themselves but to their neighbours. With what success this arduous undertaking has been attended can be seen in almost every quarter............the Government have every reason to feel proud of the results of their timely action in the matter."

That this good start has been thoroughly well maintained will be agreed to by all interested in Coconut planting in the Federated Malay States.

Apart from his inspection work Mr. Brown's knowledge of Coconuts and their cultivation have been freely at the disposal of all those who have been interested. His Bulletin, No. 11, on" Coconut Cultivation" has been and is always in great demand. It is interesting to note that while in 1903, Mr. Brown estimated the total acreage under Coconuts in the Federated Malay States at 77,500, in 1912 his figure is approximately 157,600 acres, more than double, in spite of the effects of the "rubber boom."

Not only with regard to Coconuts, but in many other branches of Agriculture, Mr. Brown has acquired an immense fund of knowledge, which was of the greatest value to the Department of Agriculture and to planters generally. If ever an out-of-the-way subject came up for enquiry, Mr. Brown was always applied to and usually had valuable information to impart.

Mr. Brown's colleagues and friends in the Department of Agriculture and among the planters of Malaya view with great regret his resignation. They trust, however, that he will be among us for many years, giving us the benefits of his wide experience and knowledge.

L. LEWTON-BRAIN.

THOROUGH DRAINAGE AND THE PREVENTION OF MALARIA.

BY FRANK D. EVANS, A. M. INST. C. E.

Executive Engineer, Malaria Advisory Board, F. M. S.

The influence of drainage and cultivation on malaria was noticed before Ross definitely showed the part taken in its transmission by the anopheline mosquitoes, but the question was confus-

ed by the amount of sickness which invariably occurred when drainage and cultivation or works involving heavy earthwork were undertaken, and it was not until after Ross made his discovery that logical conclusions could be formed from the large amount of information available on the subject. Since that time many measures directed against the mosquito have been tried and one of these, thorough drainage, it is proposed to consider in this short paper, with special reference to its use on estates in the Malay States.

Thorough drainage, or to give it an appropriate title much used in this country, anti-malarial drainage, may be taken to imply the drainage of land in such a manner that no wet ground, swamps nor pools remain after drainage, and that the drainage water flows freely in the channels provided.

Flat land and swamp drainage present no technical difficulties as a rule unless the ground it is desired to drain be subject to tidal inundation, and experience has demonstrated that clearing and draining over a sufficient area on the flat land near the coast will completely eradicate malaria. Fortunately on that land good drainage is essential for agricultural development and happens to coincide with the measure best calculated to abolish malaria. In addition the character of the peaty soils usually found on the coast land seems to be unfavourable to the development of many varieties of anopheline mosquitoes, although the information available is not sufficient to justify more than a general statement on this point.

Hill land on the other hand presented a great many difficulties, but three years ago despite many efforts made, the thorough drainage of hill land was an unsolved problem. The problem has been completely solved (1) and it is now economically practicable to apply thorough drainage to any type of land with certainty of success.

What is required of drainage as an anti-malarial measure? Water is a necessity for propagation of mosquitoes, but all varieties of mosquitoes will not develop in any kind of water. Mosquitoes do not breed in running water moving with a fair velocity, as their larvæ do not obtain food in such water. Moreover for some days in the life of a mosquito, the egg stage and to a less degree the pupa stage, it is quite at the mercy of the flowing water and would be carried many miles away from the place where the egg was deposited, so that if a stream can be imagined flowing from hills to sea with no obstruction, and mosquitoes by some chance in existence along it, time only would be necessary to effect the complete disappearance of mosquitoes owing to their gradual transference towards the sea. The essential for anti-malarial drainage is therefore that all water shall flow with a fair velocity in channels free from obstructions.

(1) The anti-malarial drainage work carried out by Government at Kuala Lumpur is here referred to.

In hill land open earth drains cannot as a rule satisfy this condition owing to the pools and wet ground which form in them and along their sides, and the influx of matter which impedes the flow of water, all consequent on the violent conditions to which the drains are subjected to during rain, and the steep slope to which it is necessary to form drains in ravines. The problem of anti-malarial drainage is therefore not to cause water to flow out of sight but to cause it to move in such a manner that it does no damage to its channels and that no pools nor wet ground are left, and also to arrange that it shall not be easy for such channels to become blocked in any way, and when this occurs that the channels shall be immediately cleared. It was not necessary to go outside available methods to provide a solution for the difficulties mentioned in the last paragraph. They are got over largely by the use of sub-soil pipe drains similar to those used for agricultural drainage elsewhere, and the principles now followed in ravine drainage are those formulated early in the eighteenth century by Elkington, an English Agriculturalist. But for the sanctity which seems to have surrounded them it would hardly seem necessary to state that earthenware pipes have no anti-malarial properties in themselves, they only provide an inexpensive channel in which to run small streams of water, and the effect of their use in the reduction of malaria does not depend only on their application but on the method and skill with which they are used. It seems almost ridiculous to labour this point, but common conversation on the subject leads one to believe that it is often lost sight of. Any method of laying pipes for drainage will not necessarily give the required results.

The problem of anti-malarial drainage as applied to hill land is that given in detail above with the additional difficulties experienced in keeping the drainage system in the required order. It is of little use to provide adequate drainage if frequent storms can wreck the system, as has happened constantly in many places. As stated this particular problem was solved in Kuala Lumpur, and it has there been demonstrated on an extensive scale that thorough drainage on hill land can be carried out in an economical and satisfactory manner, with the certainty that almost no further expenditure other than that required for the purpose of keeping grass cut short over the drained area will be needed, provided that the work is well done under the close supervision of those having the necessary experience.(2) The results obtained in Kuala Lumpur are most satisfactory

(2) The Malaria Advisory Board intended that the work in Kuala Lumpur which includes work on the Government Plantation, should serve as an example to those interested, and the Executive staff to the Board will take any such persons over the work.

and demonstrate in a striking manner the advantage of anti-malarial drainage properly executed. Unfortunately the results are still affected by the continued existence of swamps known to favour the breeding of anopheline mosquitoes, and what malarial sickness remains in the Town is largely due to these swamps. Also although almost the whole of the hill area has been drained there still remains a section of the Town consisting of flat land where work is now in progress.

The table below gives the true total death rate and the malarial death rate of the Town for each year since 1907.

	1907.	1908.	1909.	1910.	1911.	1912.	1913.
True death rate per 1000.	37.9	43 7	32.3	30.3	39.4	36.7	35.5
Malarial death rate per 1000	9.7	10.7	7.7	9.8	9.9	5.8	4.2

It was at the end ot 1911 that the work done was first completed thoroughly enough to affect considerably the health of the population of the area drained, and all work done since has been equally thorough. The results are evident from an inspection of the table. Malaria does not prove fatal as a rule except after many attacks and the reduction in the malarial death rate means an enormous reduction in malarial sickness. Malaria can and will be practically eradicated from Kuala Lumpur.

Further interesting figures are available from the health returns of the Police Depôt, Kuala Lumpur, for the years 1910 to 1913 inclusive, and the table below gives the average percentage of Indian recruits at the Depôt who were detained in hospital or given sick leave for malaria monthly :—

	1910.	1911.	1912.	1913.
Average monthly percentage.	35.75	57.01	27.33	11.3.

The protective works were practically completed early in 1912 except for the continued existence of one of the swamps mentioned above which still affects the health of the Depôt and the Town in the neighbourhood, and further great improvement will take place when anophelines no longer breed in it.

The monthly percentages given above mean that in 1911, to take the worst case, every Indian at the Depôt was in hospital or given sick leave for malaria on an average 7 times in the year. Very few places can show a sickness rate to compare with this, and when it is stated that the men are picked healthy Sikhs and Pathans of a fairly high physical standard it will be realised what the condition of the labour force having a poor physical standard would have been under the circumstances. It may be mentioned that the improvement was obtained notwithstanding the large increase in the population at the Depôt subsequent to 1911 when a considerable number of the men were unprotected by mosquito

nets at night. An increase in the density of a population is invariably associated with a more rapid increase in the Malarial sickness rate. Quinine has only been given to the men under hospital treatment or to those who cared to ask for it.

Amongst the Government Officers and their servants who live in the drained area to the west of the railway few cases of malaria have occurred since the beginning of 1912, and none of these have been reported by the Medical Authorities as having been infected or re-infected in the area itself. That the improvement in the malarious condition of Kuala Lumpur has been due to the works undertaken is proved by the fact that malaria persists in the neighbourhood of the swamps already referred to, and also on the limits of the drained area. Several new bungalows on the Experimental Plantation were occupied early in 1913 and nearly all the occupants suffered severely from malaria. Since the middle of the year when drainage work in the neighbourhood, commenced in January, afforded definite protection no new cases have occurred. Temporary lines were built for 200 Tamil coolies on the western limit of the drained area early in 1913. The Tamil coolies, who had not had malaria for the previous year or two, were attacked so severely that they had to be removed elsewhere. An attempt to house Chinese coolies in the lines had similar results and the lines have been abandoned. Estate coolies living in lines to the south of the drained area suffered severely from malaria during 1913 and the Estate Authorities are now carrying out a thorough drainage scheme to protect them.

While the experience and results obtained from the work in Kuala Lumpur are very convincing there is a feeling in existence that the conditions in the Town are perhaps in some way different from those which obtain on estates, and under any circumstances the results got from extensive work over a large area such as Kuala Lumpur is not strictly comparable with work which would need to be done on an estate in order to protect an estate population. This is to some extent no doubt true, but a demonstration now about to be carried out on a very malarious estate in Negri-Sembilan (3) will shortly provide information on the required lines. Much anti-malarial drainage has already been put in on estates in the Malay States, and on many recently protected and where work is in progress, the methods and manner in which the work has been done leave no doubt as to the results, which are already evident.

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(3) Government are about to thoroughly drain an area covering a distance of ½ mile from a central line site on Terentang Estate, Negri Sembilan, to demonstrate the advantages of Anti-Malarial Drainage properly carried out. The results will be made public periodically.

Whatever arguments are put forward for the good to be derived from any particular measures affecting health they are not likely to be productive of action on the lines advocated unless it can be shown conclusively that such measures will result in an increased return from labour to those who undertake them, and an attempt will be made to show that anti-malarial drainage will result in economy on malarious estates in hill land.

First as to the original cost, it may be accepted that any hill land unless it possesses quite exceptional features can be thoroughly drained at a cost *not exceeding* \$36 per acre of gross area drained. It is at present considered necessary to drain thoroughly all land within a distance of ½ mile of the coolie population, although a less distance will give adequate protection to an ordinary bungalow. From this rate per acre the maximum cost of anti-malarial drainage work necessary on any estate can easily be obtained (4) and to this must be added any special expenditure which may be necessary to bring buildings within one sanitary area. The cost of maintenance may be accepted as 10 per cent. of the original cost in the year following construction and 5 per cent. in subsequent years. These are the maximum normal figures, but it must be remembered that undesirable saving of expenditure on construction will most certainly result in heavier charges for maintenance.

Against the expenditure on thorough drainage has to be set the greater working capacity of the labour force, the greater efficiency of the labour force consequent on better management resulting from the more active supervision on the part of a healthy manager and assistants, reduction in recruiting expenses due to improved health of estate, and reduction in medical administration expenses.

The greater working capacity and efficiency of the labour force following improved health conditions will usually be the most important. The difference between the cost of output of a well and badly managed labour force can easily amount to 50 per cent. or more, especially when the force works for day wages. On a malarious estate in Selangor having a manager and six assistants there have been occasions when only one has not been confined to his quarters with malaria. Efficient management is impossible under such conditions.

From the foregoing and the knowledge of the facts affecting any particular estates, those interested can form an approximate estimate of the cost of thorough drainage and the probable economy which will result from it.

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(4) The executive staff of the Malaria Advisory Board will if requested advise estate managers as to the work required and its probable cost.

THE AGRICULTURAL PESTS ENACTMENT NO. 13 OF 1913.

BY F. W. SOUTH.

Introduction.

Public opinion in the British Colonies and Protectorates has for more than 10 years been alive to the desirability of legislative control to regulate the importation from outside countries of plants that might serve as carriers of pests and diseases previously unknown. Only recently, however, has the same desirability been recognised for the provision of legislation to control such plant pests and diseases as are already known to exist within certain Colonies and Protectorates. In 1907 the Governor of Ceylon with the consent of the Legislative Council passed an Act to provide for the destruction of plant pests and for the sanitation of plants in that Colony; in 1912 an Enactment with a similar object came into force in Trinidad. In the Federated Malay States an Enactment was passed by the Federal Council and published in the Government Gazette of August 1st, 1913, to provide for the Protection of Trees, Plants and Cultivated Products from Disease and Pests; it makes rules for the control of pests and diseases that already exist or may arise in this country and also gives power to the Chief Secretary to make such rules as he considers necessary to regulate the importation of plants likely to introduce pests or diseases from other countries. Previous to this the only legislation of the same nature in this country was in the form of the Coconut Trees Preservation Enactments of 1898 which provided regulations for the control of two serious coconut pests, the Rhinoceros and red beetles. These were repealed by the present Enactment as their main provisions are embodied in it.

The advisability, or rather the necessity for the existence of the new Enactment becomes obvious when it is considered that by far the greater portion of the cultivated area in this country is planted with one permanent crop only and that very large sums of capital are invested in it. If any epidemic were to destroy this crop entirely the financial loss would be enormous; there would be nothing to fall back on as there is no secondary crop occupying any wide area at present with the exception of padi which is entirely in the hands of the Malays; while the area under coconut estates represents an almost negligible fraction of that under rubber estates. In view of this it is clearly necessary that every possible precaution should be taken to protect the rubber cultivations from any possible epidemic of disease.

The main sources of danger to any cultivated crop are shortly as follows: Circumstances, such as weather conditions, may for a period greatly favour the growth and increase of some pest or

disease long known to exist to a limited extent, so that it rapidly develops, if untreated, into an epidemic.

Some insect or fungus, previously confined to other hosts either cultivated or wild may become adapted to the crop and then spread with extraordinary rapidity. If such a pest or disease is known on its original host measures may be available for its control. In this country, however, there are enormous tracts of jungle surrounding the groups of estates and from these an unknown insect or fungus might spread to rubber. Before such could be properly controlled it would be necessary to study their life histories, so that it is important that they should be discovered as soon as possible and fully investigated before they obtain a firm hold or reach epidemic proportions.

Finally there is the danger from the introduction by way of plants imported from outside of some pest or disease not previously known, but capable of spreading very fast through large areas occupied by a congenial host plant.

A very serious contributory factor to the danger of some pest or disease developing as an epidemic in this country is the presence among the large estates of a great number of small native holdings. These are often planted with rubber and in many cases are badly neglected so that the rubber is of poor growth and even if fairly free from disease is sickly and in a condition to succumb at once to any attack. Treatment of diseases or pests in these holdings is hardly ever practised, unless insisted upon, and in consequence they form a ready source of reinfection for neighbouring estates where usually much care is devoted to the control of pests and diseases. No effective control could be exercised over the increase of any ailment of rubber unless concerted action could be relied upon such as would include the small holdings also.

It is the object of the Agricultural Pests Enactment to minimise these various sources of danger to cultivated plants, and especially to rubber, by creating a staff of trained Inspectors provided with adequate powers to deal with the situation. These Inspectors form part of the establishment of the Agricultural Department and are under the control of the Director. They will endeavour to control the danger to cultivated plants from pests and diseases by work along the following lines. Firstly they will be at liberty to give information regarding the nature and treatment of any known pest to any one applying to them for assistance, the advice as to treatment will be along the lines recommended by the Mycologist and the Entomologist to the Agricultural Department. Secondly they will endeavour to pay periodical visits to every estate in the country and to the majority of small holdings so that if any new disease appears from the jungle they may become aware of it and report

it to the Mycologist or Entomologist for investigation immediately, thus enabling it to be dealt with before it becomes wide spread. These visits of inspection will also serve to show what estates and small holdings are in an insanitary condition or contain any known pest or disease which is not receiving treatment, in consequence of which these holdings or estates constitute sources of danger to their neighbours. By virtue of the powers conferred on them by the Act the Inspectors can require the owners or occupiers of insanitary cultivated areas or crops to take such steps to render their land or crops sanitary as the Inspectors may require. If the owners or occupiers fail to do this the Inspectors can cause the measures to be taken and then the Director of Agriculture can recover the cost by a civil suit subject to certain restrictions which will appear later. Criminal actions involving a maximum fine of $500 can also be instituted against such defaulters. Thus adequate means are provided for ensuring that all owners or occupiers of cultivated land, shall keep their land in such a condition as shall prevent it from serving as a source of danger to neighbours. As has already been stated, the danger due to the possible introduction of pests and diseases from outside countries is to be met by special rules laid down from time to time by the Chief Secretary regarding the importation of plants, since the Enactment gives him power to make such rules at his discretion.

It may be pointed out here that the Inspecting Staff is not intended to carry on any original investigations or to devise experimental treatment. It will merely report any suspected new pest or disease to the Entomologist or Mycologist and act on their recommendations as regards treatment. It may also be pointed out that the Staff hope to be able, as a result of their contact with the natives, to develop among them a knowledge of the elementary principles of good agriculture and to give them friendly advice which will gradually lead to a generally improved condition of their holdings and result in a higher standard of sanitation being maintained on these.

The Enactment:—Title and Definitions.

Sections 1 and 2 of the Agricultural Pests Enactment No. 13 of 1913 deal with the title and with definitions. In this connection attention may be called to the definition of the term "pest" in Section 2, subsection (vi), which runs as follows: "Pest" includes every insect, invertebrate animal, rodent, plant and fungus which is destructive or injurious, or apt to be destructive or injurious, to cultivated plants. This is a wide definition and includes rats and squirrels among rodents and lalang or any other harmful weed among plants.

These can be dealt with in accordance with the terms of the Enactment so long as they occur on cultivated land. The term "plant" is also given a wide definition to include any tree, shrub or vegetation, whether living or dead, and includes the stem, root, leaf, flower or fruit and any product or part thereof whatsoever, whether severed or attached.

Staff.

Section 3 deals with the appointment of the staff necessary to carry out the terms of the Enactment. The Chief Secretary may from time to time appoint as many Inspecting Officers as he thinks fit and may limit the areas within which any or all of them shall exercise their powers and perform their duties (Subsections i and ii). In accordance with subsection iii an Inspecting officer may with the written approval of the Director of Agriculture delegate by writing to an officer subordinate to him any powers or duties assigned to an Inspecting Officer by the Enactment.

In accordance with this section the following staff were appointed as Inspectors by the Chief Secretary by notification in the Government Gazette of September 12, 1913.

Mr. L. C. Brown, Inspector of Coconuts, F.M.S. Mr. F. W. South, Chief Agricultural Inspector.	Throughout the Federated Malay States.
Mr. A. G. G. Ellis, Assistant Agricultural Inspector Mr. D. G. Deeble, Assistant Inspector of Coconuts	For the State of Perak.
Mr. F. de la Mare Norris, Assistant Agricultural Inspector	For the State of Selangor.
Mr. P. B. Richards, Assistant Agricultural Inspector	For the States of the Negri Sembilan and Pahang.
Mr. T. C. Nock, Assistant Inspector of Coconuts	For the States of Selangor and the Negri Sembilan.

and by notification in the Gazette of February 27, 1914

Mr. H. H. Stirrup, Assistant Agricultural Inspector, Perak South.	For the State of Perak.

Mr. L. C. Brown retired at the end of last year. On the arrival of Mr. Stirrup the work in Perak was divided between Mr. Ellis and Mr. Stirrup, the former being stationed at Taiping and having charge of the work in Perak North comprising the districts of Kuala Kangsar, Larut, Matang, Selama, Krian and Upper Perak, and the latter being responsible for Perak South including the districts of Kinta, Batang Padang and Lower Perak, with his head-quarters at Batu Gajah. Mr. Deeble is also stationed at Batu Gajah and at present will assist Mr. Stirrup with his duties. Mr. South, Mr. Norris, and Mr. Nock are stationed in Kuala Lumpur, and divide the duties in

Selangor, the last mentioned having charge more especially of the section of the work relating to coconuts. Mr. Richards' head-quarters are at Seremban. The work in Pahang will be carried out by Mr. Richards or the Chief Agricultural Inspector according to convenience.

Under Subsection iii of this section the staff of Sub-Inspectors of Coconuts have been appointed Inspectors under the Enactment by the Chief Agricultural Inspector with the written approval of the Director of Agriculture. Their powers are limited to the districts to which they are appointed. Of these, 4 are stationed in Perak North under the control of the Assistant Agricultural Inspector, Perak North, 3 in Perak South under the control of the Assistant Agricultural Inspector, 4 in Selangor in charge of the Assistant Inspector of Coconuts, 4 in the Negri Sembilan in charge of the Assistant Agricultural Inspector, and 4 in Pahang in charge of the Assistant Inspector of Coconuts, Mr. Nock. The organisation of the whole staff is in the hands of the Chief Agricultural Inspector now that the Inspector of Coconuts has retired.

If the need should arise other Government Officers such as District Officers and Assistant District Officers can be given powers as Inspectors under the Enactment. Similar powers can also be given to the Malay Assistants of whom one is attached to each of the Agricultural Inspectors.

Supervising Committee.

Section 4 deals with the constitution of a supervising Committee to act, as it were as a court of appeal. Any owner or occupier who objects to the instructions given him in a notice served by an Inspector may in accordance with Section 7 appeal to this Committee for their cancellation or modification on the grounds that the instructions are unreasonable or unnecessary and the Committee may then take such action as it thinks fit. This Committee is to consist of the Director of Agriculture, as Chairman, and not less than two other persons nominated by the Chief Secretary, and of these not more than one-half are to be officers employed in the public service. Such a Committee has already been appointed.

The considerations rendering an Enactment of this nature advisable its title, definitions and the composition of the necessary staff have now been dealt with. The actual method of procedure laid down by it for dealing with insanitary cultivated land and with crops attacked by pests or disease, as well as the remaining provisions of the Enactment will be dealt with in the next number of the *Agricultural Bulletin.*

(*to be continued*)

INTERNATIONAL RUBBER CONGRESS, BATAVIA.

We have pleasure in publishing the following preliminary programme of the congress which is to be held in connection with the International Rubber Exhibition at Batavia in September this year.

It has been decided that the Federated Malay States Government and the Planters' Association of Malaya shall be officially represented, and it is hoped that many planters and others interested in rubber from Malaya will also attend. The Hon. Secretary to the Malayan Committee, Mr. W. E. van Rynberk, Singapore, asks all those who propose to attend to send their names to him as soon as possible. Special congress tickets are issued at a cost of $7.00, entitling the holder to reduced railway fares in this country and Java, special steamer fares, etc.

Sunday, September 6.

Arrival of Dutch mailboat from Europe *via* Colombo and special Congress Steamers from Deli and from Port Swettenham and Singapore.

Monday, September 7.

(1) *Address* by Prof. F. A. F. C. Went, of Utrecht University on "Science and Tropical Cultivation."

(2) *Address* by Henry C. Pearson, New York, on "What Manufacturers desire in Crude Rubber."

Tuesday, September 8.

(1) *Address* by Prof. Erwin Baur, of Berlin University on: "Die Fortschritte der Vererbungsforschung und Ihre Bedeutung für die Züchtung tropischer Kulturpflanzen, besonders der Kautschukpflanzen."

(2) *Discussion* on "Selection of Hevea."

Introductory paper by:

Dr. P. J. S. Cramer, Buitenzorg, Java.

(3) *Discussion* on "Diseases and Pests of Hevea."

Introductory papers by:

Dr. C. J. J. van Hall, Buitenzorg, Java.

Dr. A. A. L. Rutgers, Buitenzorg, Java.

Wednesday, September 9.

(1) *Address* by Dr. Schüffner, of the Medical Institute, Medan, Deli, on: "Hygienic Measures."

(2) *Discussion* on "Catch-crops and Intercrops."

Introductory papers by:

Dr. Th. Wurth and Dr. P. Arens, Malang, Java.

Dr. C. J. J. van Hall, Buitenzorg, Java.
Dr. J. W. Gallagher, Deli, Sumatra.
Mr. R. W. Munro, Morib, Selangor, F. M. S.
(3) *Discussion* on "Planting distances and thinning out."
Introductory papers by:
C. M. Hamaker, Kiara Pajoeng, Java.
The Hon: Mr. E. B. Skinner, Kuala Lumpur, F. M. S.
....Ceylon.

(4) *Discussion* on "Artificial Fertilisers" and "Green Manures" for Hevea.

Introductory papers by:
Dr. A. W. K. de Jong, Buitenzorg, Java.
Mr. Calland, Kalthur, Ceylon.*
Mr. M. Barrowcliff, F. I. C., F. C. S., Kuala Lumpur, F. M. S.
Mr. F. G. Spring, N. D. A., U. D. A., Kuala Lumpur, F. M. S.

Thursday, September 10.

(1) *Discussion* on "Tapping and Tapping Systems."
Introductory papers by:
Dr. A. W. K. de Jong, Buitenzorg, Java.
Mr. F. G. Spring, N. D. A., U. D. A., Kuala Lumpur, F. M. S.
(2) *Discussion* on "Preparation of Rubber."
Introductory papers by:
Dr. A. J. Ultée, Djember, Java.
Mr. B. J. Eaton, F. I. C., F. C. S., Kuala Lumpur, F. M. S.
Mr. Stafford Whitby, Kajang, F. M. S.
Mr. Sydney Morgan. F. M. S.*

(*Evening.*)

Address on the "Collection of Rubber in Brazil" by Dr. P. J. S. Cramer, Buitenzorg, Java.

Friday, September 11.

(1) *Discussion* on the "Reduction of Cost Price of Rubber." How to realise it?
Introductory papers by:
Mr. E. A. O. Vervooren, Bandoeng, Java.
.... Ceylon.
Mr. E. Macfadyen, F. M. S.

(2) *Demonstration* of the "Scientific methods of Rubber testing' on the Exhibition grounds by:

Mr. B. J. Eaton, F. I. C., F. C. S., Kuala Lumpur, F. M. S.
Prof. G. van Iterson and J. G. Fol, Delft, Holland.

Saturday, September 12.

(1) *Address* by Mr. J. G. Fol, Delft, Holland, on "The Results on Scientific Testing of the Empirical Appreciation of Raw Rubber."

(2) *Discussion* on "Methods of Testing Raw Rubber."

Introductory papers by:

Mr. J. G. Fol, Delft, Holland.

Mr. B. J. Eaton, F. I. C., F. C. S., Kuala Lumpur, F. M. S.

Dr. W. R. Tromp de Haas, Buitenzorg, Java.

* *Invited.*

Buitenzorg, January 22, 1914.

The 2nd Secretary of the Congress-Committee.

DR. A. A. L. RUTGERS.

REPORT BY THE IMPERIAL INSTITUTE, LONDON, ON A SAMPLE OF FIBRE PREPARED GROWN AT THE EXPERIMENTAL PLANTATION, KUALA LUMPUR.

Introductory Note.

BY F. G. SPRING.

At the request of the Director of Agriculture, F. M. S., a sample of fibre was prepared from plants grown at the Experimental Plantation, Kuala Lumpur, and forwarded to the Director, Imperial Institute, London, to be examined and valued and to have its tensile strength, in particular, determined.

The method in which the fibre was obtained is as follows:—

The lower, thick, green, fleshy leaves were cut by means of an ordinary pruning knife at an early hour in the morning and made into bundles of about thirty leaves to a bundle, each of which was immersed in a more or less stagnant pool of water the same morning. The leaves were kept under the surface of the water by means of wooden posts placed on top of them. The duration of immersion was 14 days, at the close of this period the bundles were removed, untied, washed in fresh water, and the individual leaves were put through ordinary rubber factory rollers; this removed a large amount of the soft fleshy pulp. At this stage the fibre was well washed in running water, afterwards being placed on boards and beaten with sticks; this removed an additional quantity of pulp.

The combing or scraping was done between blunt pieces of iron, small quantities being subjected to this treatment at a time, each individual strand of fibre being afterwards pulled through the coolies' hands to remove any remaining impurity. The fibre was then soaked in clean water for about one hour and afterwards hung up to dry, first in the shade and later in the sun.

This process is undoubtedly a laborious one and in order to extract the fibre in an effective and economical manner an order was placed last year by the Federated Malay States Government for some modern fibre machinery. This has now being received by the Agricultural Department, Kuala Lumpur, and it is hoped that in the near future results of considerable interest, in connection with various fibre producing plants, may be obtained.

It is doubtful if the sample forwarded as Sisal hemp to the Imperial Institute is true sisal (Agave rigida var. sisalana). Bulbils of the true sisal hemp have been received from Manila.

It might also be added that several other varieties of fibre producing plants are being cultivated at the Government Plantations for the purpose of experimental work, such as Manila hemp, Sansevieria spp,, etc.

With regard to the report from the Imperial Institute it is gratifying to note that fibre similar to the sample forwarded would be saleable in large quantities for cordage manufacture, and that a more valuable product could probably be obtained by the use of modern machinery.

Imperial Institute Report.

Description of Sample.

The sample consisted of ¾ lb. of lustrous fibre, fairly well cleaned and prepared, but of slightly uneven colour, varying from cream to brownish-yellow, and generally considerably darker in tint than is usually the case with Sisal hemp. The length of staple varied from 2 feet 8 inches to 6 feet, with an average of 4 feet 3 inches.

Result of Examination.

(1) The fibre was submitted to chemical examination with the following results, compared with corresponding figures for a sample of Sisal hemp from the East Africa Protectorate.

	Present Sample.	Sisal hemp from the East Africa. Protectorate
	Per cent.	Per cent.
Moisture	12.0	11.1
Ash	0.8	1.0

	Present Sample.	Sisal hemp from the East Africa. Protectorate
	Per cent.	Per cent.
a-Hydrolysis, loss	11.3	11.2
b-Hydrolysis, loss	20.1	14.1
Acid purification, loss	1.9	2.3
Cellulose	77.1	78.2

The length of the ultimate fibres varied from 0.06 to 0.29 inch, with an average of 0.19 inch.

The dark colour of the fibre as received at the Imperial Institute was found to be due to the presence of iron, which may have been derived either from the water used in washing or from the scraping instruments used in preparing the fibre. After removing this iron by the use of chemicals, the washed and dried fibre was of a light cream colour.

(2)) The fibre was examined for tensile strength and elongation in comparison with a standard sample of Sisal hemp from East Africa. Using a length 20 cms. of fibre for the tests, the following average results were obtained :—

	Present Sample.	Sisal hemp from East Africa.
Breaking stress in gram.	618	1102
Extension before breaking per cent.	4.5	2.0

Taking the East African Sisal hemp as the standard, the ratios are as follows ;—

	Present Sample.	Sisal hemp from East Africa.
Breaking stress	56	100
Extension	225	100

The above figures indicate that the present sample has only 56 per cent. of the strength of the East African Sisal hemp but it is 2¼ times as extensible as the latter.

Commercial Valuation.

The fibre was submitted to a firm of merchants, who valued it at £ 25 per ton in London, with Mexican Sisal at £ 26 per ton (December, 1913).

Remarks.

Fibre of this quality would be saleable in large quantities for cordage manufacture. A more valuable product could probably be obtained by extracting the leaves with modern machinery and brushing the fibre produced.

THE UTILISATION OF PARA RUBBER SEED.

An interesting article on the utilisation of Para Rubber seed appears in the latest *Bulletin of the Imperial Institute* from which this abstract has been prepared.

Samples of the seed were distributed to various firms for technical trial, and samples of the cake, after expressing the oil, were sent to the South Eastern Agricultural College, Wye, for feeding trials. The results of these trials may be summarised as follows :—

Para Rubber Seed Oil.

Paint and Varnish Manufacture:—One of the principal uses to which the oil may be put, is the manufacture of paints and varnishes, since it belongs to the class of oils known as drying oils and closely resembles linseed oil for which it forms a good substitute for the above purposes.

The opinions expressed by manufacturers to whom the samples were sent for trial, indicate, that unless the oil could be obtained at a fairly reasonable price compared with linseed oil, it would not be able to compete with the latter.

Linoleum manufacture :—Several trials were made with the oil for this purpose and the general opinion was that it was not very suitable for linoleum manufacture and could not be used as a substitute for linseed oil, unless the price was very low.

Soap Manufacture:—One firm of oil crushers were of opinion that it would be equal in value to linseed or cotton seed oil for the manufacture of soft soap.

Conclusions.

The opinion is expressed that there would be no difficulty in finding a suitable market for the oil, not only as a substitute for linseed oil, when the latter was high in price, but also for purposes for which linseed oil was unsuitable.

The problem of utilising the oil is concerned principally with the cost of manufacture of the oil and the quantities available.

In view of the new processes recently patented for the "hardening" of liquid oils by hydrogenation, a new market may be found for oils of this type, *e.g.* in candle making or even for edible purposes.

Para Rubber Seed Cake.

Feeding trials:—The first consignment of cake from Rangoon, which was used in the feeding trials, was abnormal, since it contained about 18 per cent. of fat, whereas not more than 6 to 9 per cent. would be normally present in the cake from well-expressed seeds.

In the second series of experiments a cake of more normal composition was used.

In the first trials, which were on a small scale only, the cake was fed to cows; most of them ate the cake readily after it was moistened with water. (N. B. It is dry and powdery in the natural state.) No abnormal results were obtained.

Similar results were obtained in the case of sheep which did not like the cake when fed alone, but ate it when mixed with other foods.

In the second series, $1\frac{1}{2}$ tons of cake made from kernels obtained from Ceylon, were used. The cake used is stated to resemble a normal market product, and to be comparable with linseed cake used in England.

The following results were obtained from these feeding trials:—

Sheep:—A group of animals accustomed to trough feeding were used and the smallest admixture of Para seed cake in other concentrated food was detected by them and left uneaten, even when the total food supplied over a fortnight was reduced below the ration necessary for maintenance.

All attempts at feeding sheep with the cake failed.

Young Cattle. These ate the cake readily, but when the quantity was increased to 8 lbs. per head daily, scouring occurred and even 5 lbs. per day with 56 lbs. of mangold, produced slight laxative effects. Further experiments confirmed these results, and the cake should not therefore be fed in larger quantities than this latter amount.

The beef from two of these cattle, subsequently slaughtered, after having been fed with Para seed cake at the rate of 6 lbs. per day for ten weeks, was very favourably reported upon.

Dairy Cows:—Six barren cows were taken for this trial and were fed with increasing quantities of Para rubber seed cake up to 14 lbs. at the end of a week, this being the only concentrated food given. No change was observed in the excreta after continuing the trial for six days. The yield of milk rose, as the food was richer than that normally fed, but the percentage of milk fat was unchanged. Butter made from the milk was normal. The conclusion is drawn that dairy cows may be safely fed with Para seed cake.

Full grown fattening cattle:—The dairy cows used in the previous trial were fattened while in milk, the amount of Para seed cake fed being reduced from 14 lbs. to 8 lbs. with the addition of 4 lbs. of other cake.

The cows remained healthy and gave a high milk yield, till they were intentionally dried off a month before sale for slaughter. The increase per day in live weight over a period of nine weeks was 1.7 lbs. per cow.

From these experiments, the cake appears to be an excellent fattening food for cows, and its value as a cattle food has been proved.

The following is the chemical composition of the cake used in the two trials in comparison with linseed cake:—

	Para seed cake (abnormal sample)	Para seed cake (normal sample)	Linseed cake
Moisture	6.91	8.75	11.6
Crude proteins	29.93	30.19	29.5
Consisting of:—			
True proteins	27.03	24.85	
Other nitrogenous substances.	2.90	5.34	
Fat	17.68	8.71	9.50
Carbohydrates (Starch, etc.)	35.97	41.71	35.54
Fibre	4.82	5.01	9.10
Ash	4.69	5.60	5.20
Nutrient ratio		1:20	1:20
Food units		139	133.

The close agreement between the normal cake and Linseed cake is very marked. A small quantity of cyanogenetic glucoside was present, yielding approximately 0.02 per cent. Prussic acid, a negligible quantity.

Para Rubber Seed Kernels.

A sample of kernels from Ceylon yielded 45 per cent. of oil, on extraction with solvents.

A sample of the extracted oil was found to give a high "acid value," and this was seen to be the cause of the poor non-spreading qualities of paint prepared from it. A high "acid value" is given by oil from damaged or old kernels, which indicates the necessity of only using sound seeds. If seeds are decorticated in this country, as they should be for export, they should be well sun-dried, to prevent moulds, which are likely to break up the fat into free acids.

B. J. E.

ULU SELANGOR DISTRICT PLANTERS' ASSOCIATION.

A general meeting of this association was held at the Kuala Kubu Rest House at 9.30 a.m. on Sunday March 8th, 1914.

The following were present:—Mr. W. De L. Brooke Chairman, Mr. W. A. Henderson Hon. Sec., Messrs. R. M. Newton, G. E. Howard, E. G. Leggatt, R. P. Mackilligan, M. D. Fallon, and F. W. Davies.

The following business was discussed.

Minutes of the previous meeting were read and passed.

Chairman of the P. A. M.: Proposed by Mr. Newton seconded by Mr. Mackilligan that Mr. E. Macfadyen be the chairman for the P. A. M. for the year. Carried unanimously.

The Secretary read letters from the Controller of Labour with regard to sub-committees of the local associations being appointed to confer with the Controller in matters which come within the meaning of parts 8 and 9 of the Labour code. It was agreed to be a great advance that Planters, the community most concerned, be consulted in matters directly affecting their interests in different localities.

A letter was read from the Secretary of the P. A. M. asking for the views of the local association on paragraph 40 of the Labour code.

An interesting discussion followed in which various members spoke of instances where this provision of the Labour code did not bring within its ruling employers of labour who did nothing towards bringing labour into the country. Resolved that the Secretary write to the Controller of Labour for his interpretation of the law in so far as it affected employers of Indian labour not resident on the place of work.

Delegates: Proposed by Mr. W. De. L. Brooke seconded by Mr. E. G. Leggatt that the Chairman and Secretary be elected as delegates of the association to the P. A. M. Carried unanimously.

Election of Officers: Proposed by Mr. W. De. L. Brooke seconded by Mr. Howard that Mr. F. W. Davies be elected Hon. Secretary. Carried unanimously.

The following were elected by ballot as the committee in addition to the Hon. Secretary:—

Mr. M. D. Fallon (Chairman), Mr. F. W. Carey, Mr. G. E. Howard, Mr. N. W. Dakeyne, Mr. W. A. Henderson.

Sub-Committee: Proposed by Mr. Newton seconded by Mr. Fallon:—

That the incoming committee be the sub-committee to discuss any matters affecting labour with Controller of Labour.

The meeting closed with a vote of thanks to the retiring chairman.

DEPARTMENT NOTES.

Mr. L. C. Brown, Federal Inspector of Coconuts, Department of Agriculture, F.M.S., Kuala Lumpur, retired from the service on 31st January, 1914.

Mr. B. Bunting, Assistant Manager, Jin Seng Estate, has been appointed as Assistant Agriculturist, Department of Agriculture, F.M.S., Kuala Lumpur, and assumed his duties on the 10th March, 1914.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1914 and 1913.

Destination.	Exported during Jan. 1914.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1914.	Duty collected, 1914, to date.
	Tons.	Tons.	Tons.	Tons.	Tons	Tons.	$	$ c.
Straits Settlements ...	1,289.78	...	1,289.78	769.81	519. 97	...	2,097,920	52,157.88
United Kingdom ...	1,071.60	...	1,071.60	1,133.69	...	62.09	1,771,209	44,280.25
Continent of Europe ...	119.46	...	119.46	145.50	...	26.04	198,888	4,972.20
Ceylon	61.61	...	61.61	81.75	...	20.14	102,145	2,553.50
Other Countries ...	...	...	...	...	...	...	...	...
Total ...	2,542.45	...	2,542.45	2,130.75	519.97	108.27	4,170,162	103,963.83

KUALA LUMPUR,
6th February, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of January, 1914.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	144.	78.5	85.03	72.29	12.74	76.2	.857	74.6	.87%	...	14.29	6.95
Malacca, Durian Daun Hos.	29.921	156.	80.8	86.1	70.4	15.7	77.7	.933	...	.87	N.	5.19	0.62
N. Sembilan, Dist. Hospital Seremban	...	148.	78.9	90.4	70.9	19.5	75.2	.803	78.2	.81	N.	2.72	0.67
,, Dist. Hos. K. Pilah	...	152.1	78.8	86.8	73.0	13.8	77.2	.902	76.1	.91	...	6.54	1.00
,, ,, Tampin	...	...	79.3	...	...	...	74.7	.780	71.7	.78	...	3.59	0.80
,, ,, P. Dickson	...	153.1	80.4	86.7	73.5	13.2	76.6	.841	74.0	.81	...	4.84	0.85
Pahang, ,, K. Lipis	...	...	78.1	85.1	70.	15.1	74.2	...	...	...	...	12.02	2.60
Penang, ,, Penang	29.869	148.4	83.1	90.1	73.4	16.7	75.8	.808	70.2	72.6	...	1.37	1.02
Perak, ,, Taiping	...	106.	80.71	92.	69.	23.	76.50	.858	...	.82	...	13.75	3.73
,, ,, Ipoh	...	...	81.04	91.	69.	22.	75.83	.824	...	.78	...	7.84	1.54
,, ,, T. Anson	...	...	81.10	91.	69.	22.	76.56	.853	...	.80	...	15.70	2.00
,, ,, P. Buntar	...	...	80.70	90.	70.	20.	76.39	.851	...	.82	...	7.78	1.69
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	10.16	1.89
Selangor, General Hospital Kuala Lumpur	...	120.0	80.1	88.2	74.6	13.6	76.4	.839	73.9	.81	S.E.	3.39	1.35
,, Dist. Hos. Klang	...	...	76.9	86 9	70.6	16.3	75.2	...	...	...	...	9.81	1.72
, ,, K. Selangor	...	...	...	89.9	73.2	16.7	...	...	...	...	...	6.48	1.40
,, ,, Rawang	...	...	...	91.3	71.2	20.1	...	...	...	...	...	3.04	0.85
Singapore, Kandang Kerbau Observatory	29.964	161.5	79.5	92.5	71.	21.5	76.1	.849	...	.85	N. E.	24.35	4.77

THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

No. 9.] APRIL, 1914. [Vol. II.

THE AGRICULTURAL PESTS ENACTMENT NO. 13 OF 1913.

(*Continued*).

BY F. W. SOUTH.

In an article in the previous number of the *Agricultural Bulletin* the first four sections of this Enactment were dealt with. It is the purpose of this article to consider the remaining sections.

PROCEDURE FOR THE CONTROL OF INTERNAL PESTS.

A. THE ROUTINE OF THE INSPECTING OFFICERS, § § 5-9.

The provisions for dealing with the control of pests already known or that may arise in this country—one of the two main objects of this act—are contained in Sections 5-12 inclusive. In actual practice the Inspector will visit estates or small holdings and will examine them thoroughly to determine what pests or diseases are present and if those that may occur are receiving adequate treatment, he will also take into consideration whether or not the land visited is in a sanitary condition. Due notice of a proposed visit will be sent to all managers of estates. If as a result of such an inspection any pest or disease is found which is unknown to the Inspector, he will remove such specimens of it, as he may require and will forward them to the Government Entomologist or Mycologist for further investigation. Power to take this action is conferred by Section 5 on each inspector within the area for which he is appointed. If an estate is found on inspection to be free from any pest or disease, or if it is found that any pests or diseases present are being adequately dealt with a short notice to that effect will be sent to the manager signed by the Inspecting officer.

If, however, certain pests or diseases are found on any cultivated plant, which are not under control, or if the land or the plants on it are in an insanitary condition, the Inspector will send to the

owner or occupier of the land a signed notice requiring him to take such measures as are stated in the notice before a stated date. This is in accordance with Section 6. When the time allowed has expired the Inspector will revisit the land and if action has not been taken in accordance with the notice, he will report the matter to the Director of Agriculture. On receipt of a favourable reply the Inspector will send a second notice to the owner or occupier stating that as he has failed to comply with the terms of the first notice, he (the Inspector) will enter on the land with such men as may be necessary and will cause his instructions to be carried out by them, after which he will with the authorization of the Director of Agriculture recover the cost of the work by civil suit. The necessary authorization from the Director of Agriculture will have been given in the reply to the original report. After serving this notice, the Inspector will proceed in accordance with it by virtue of the powers conferred on him by Section 8. Any owner or occupier who shall have failed to comply with the terms of the original notice served on him under Section 6 will under Section 9 render himself liable also to criminal proceedings for which the maximum penalty is $500.

In order to control the powers of the Inspectors, any owner or occupier on whom a notice has been served under section 6 has the right under Section 7 to appeal to the Supervising Committee of which the constitution was described in the previous article under Section IV. This committee may suspend the operation of the original notice or make such other order as in the circumstances they may think just. Such appeal must be sent to the office of the Director of Agriculture within 7 days from the service of the original notice.

B. Special Quarantine, § § 10 and 11.

In special cases where it is considered necessary the Director of Agriculture may with the approval of the Resident of the State make an order placing in quarantine any land on which there are diseased plants, and the land will continue in quarantine until the Director shall certify that no plants on it are diseased. While any land is in quarantine no plants may be removed from it except with the permission and in accordance with the directions of an Inspecting Officer. This provision would be useful in the case of a serious local outbreak of any disease previously unknown or considered to be of but little importance. In accordance with Section 11 the owner or occupier of any land in quarantine may apply to an Inspecting Officer to examine the land with a view to obtaining a certificate of freedom from disease from the Director of Agri-

culture under Section 10. The cost of any such examination except the first must be borne by the applicant.

C. SPECIAL DESTRUCTION, § 12.

If in the opinion of the Director of Agriculture the destruction of any diseased plant is a matter of necessity or extreme urgency, he may make an order in writing directing the destruction of the plant by any person mentioned in the order, and the cost of such destruction must be defrayed by the owner or occupier of the land on which the plant is found. This provision would be of particular value in the event of the sudden appearance of one or more cases of a pest or disease known or judged liable to be capable of rapid spread and of causing serious damage.

LOCUSTS, § 13 AND 14.

The special regulations in connexion with the appearance of these insects on any land may be ascertained by reference to the Enactment itself. Special attention may however be called to Section 13, subsection (i) (*a*) which requires that any owner or occupier of land on which these insects appear shall immediately give notice of their appearance to an Inspecting Officer or at the nearest Land Office or Police Station. Ready compliance with this provision on the part of several members of the public has already been of considerable assistance to the Department of Agriculture.

SPECIAL LEGISLATION RELATING TO COCONUT TREES, § § 15-19.

These sections embody the main provisions of the Coconut Trees Preservation Enactments of 1898 which were repealed by the Enactment under consideration. It should be noticed that the execution of the provisions under these sections is in the hands of all District officers and all officers appointed as Collectors or Assistant Collectors under the "Land Enactment, 1911." Consequently the Inspecting Officers have ex officio no powers or duties under these sections; but if he think fit the Resident of any State may appoint those in his State to exercise powers and perform duties under these sections by notification in the Gazette. It may also be pointed out that when proceedings in Court are instituted by a duly authorised Officer under Sections 15 and 18 in connexion with the protection of coconut trees the written authority of the Director of Agriculture is not necessary, though in accordance with Section 25 it is necessary in all other legal proceedings under this Enactment.

Inspecting Officers can, however, deal with the pests and diseases of coconut trees and with the insanitary condition of any land upon which coconut trees are grown under the general Sections 5, 6, 8 and 9 of this Enactment. For the sake of uniformity of procedure all action relating to coconuts that has to be undertaken by an Inspecting Officer other than a District Officer or a Collector or Assistant Collector will be conducted in accordance with the general sections enumerated above. But, in special cases where it may be deemed advisable the Resident of a State will be asked to confer powers on an Inspecting Officer under Sections 15, 16, 18 and 19 by notification in the Gazette.

COMPENSATION, §§ 17 AND 20.

No owner or occupier of land is entitled to compensation for any expense incurred or damage occasioned by an order given or act done in pursuance of the provisions of this Enactment unless the damage is inflicted maliciously and without reasonable cause. "But the Chief Secretary may, in his discretion, order that such compensation as he may think fit be paid to the owner or occupier of any land who is required to destroy as a measure of precaution any plant thereon not being diseased." In no case, however, will compensation be paid in excess of the value of the plant destroyed. There is one exception to this provided for by Section 17 which authorises the Resident of any State to make any compensation he may think fit not exceeding five dollars for each tree to any owner of a coconut tree who is in needy circumstances and is required to destroy such tree. The total compensation given to any one person in one year under this section shall not exceed $100.

THE INTRODUCTION OF PESTS OR DISEASES FROM ABROAD, § 21 (i).

The Chief Secretary may from time to time make rules for preventing the introduction of pests into the Federated Malay States. "Such rules may provide, amongst other things, for

(*a*) Prohibiting the landing in the Federated Malay States from places outside the said States of any plant or animal, the landing of which may appear to the Chief Secretary to be likely to introduce any pest;

(*b*) The treatment or destruction of any plant or animal which has been landed and of the packages, cases, pots or coverings in which the same may be packed."

RULES, § 21 (ii).

The Chief Secretary may also from time to time make rules for fully and effectively carrying out and giving effect to the various provisions and powers contained in this Enactment.

Special attention may be called to the rule requiring the notification by owners and occupiers of land of the following pest and diseases namely: *Brachartona catoxantha*, a caterpillar pest of Coconuts, and Pink disease of rubber caused by *Corticium salmonicolor* = *Corticium javanicum* = *Corticium Zimmermanni*. The presence of these must be notified to the Chief Agricultural Inspector or the Assistant Agricultural Inspector in the State or that part of it in which the pest or disease is found. The notification of the former must be made within fourteen days and of the latter within one month of first finding the pest. (See The F. M. S. Government *Gazette* No. 3679, p. 1996, Vol. V, No. 59 of Dec. 19, 1913.) The object of this notification is to enable the Inspecting Staff to ascertain the distribution of these pests and to see that adequate measures are taken to control them where they occur and, if possible, to prevent their spread to districts at present free from them. Planters reporting either pest would assist the Department of Agriculture if they would at the same time report any small holdings in the neighbourhood of their estates upon which these pests are to be found.

The remaining five sections of the Enactment deal with miscellaneous details. Section 22 provides for the manner of service of notices under the Enactment. Section 23 provides that the penalty for the improper use of any material supplied by the Government for the prevention or eradication of a pest shall be a fine not exceeding $250. Section 24 provides that the penalty for any breach of the provisions of the Enactment for which no definite penalty is stated shall be a fine not exceeding $200. Section 25 has been dealt with. Section 26 states the conditions under which actions may be brought against any person for anything done in the exercise or supposed exercise of the powers conferred by this Enactment.

NOTE ON A LATEX HYDROMETER

By B. J. Eaton.

A number of enquiries has been received from planters, firms and from scientific apparatus makers in England on behalf of clients with reference to hydrometers for ascertaining the rubber content of latex, since the publication of the section dealing with the density of latex in Bulletin No. 17 issued by the Department of Agriculture, F. M. S.

Although the writer has not been able to complete the investigation of this problem, a very delicate hydrometer has been constructed by Messrs. J. J. Griffin & Sons from detailed instructions given by the writer, which should prove of value for several purposes in rubber estate factories, laboratories etc.

Density of Hevea Latex.

The principal difficulty which arises in the use of an hydrometer for testing the density of latex and thus arriving at the rubber content, is the fact that the variation in density between an average latex containing about 30 per cent of rubber and the density of pure water is only about 0.02. An average pure latex has a density of about 0.9800 compared with water with a density of 1.0000. In order therefore to make the instrument more delicate it was essential to have the graduations between 0.9800 and 1.0000 extending over a fairly long stem, otherwise differences cannot be read very accurately.

Another important point which has to be remembered is that latex is readily "fermented" by microorganisms of putrefaction, which gain entrance from the air, acting on the protein constituents and producing acidity which gives rise to the formation of bubbles of gas and causes partial clotting or coalescence of the caoutchouc globules. On this account the density of a latex which has been standing for some time is likely to differ from that of freshly collected latex, and secondly the small coalesced particles of rubber prevent the accurate working of the hydrometer.

Description of Hydrometer.

Experiments were carried out with several types of hydrometer and the most suitable instrument was found to be a brass hydrometer with cylindrical bulb and rectangular stem, the latter being graduated on both sides.

Glass hydrometers are to be preferred in many respects as they are easy to clean and do not tarnish or corrode as metal instruments are liable to do, especially in the tropics. Unfortunately however these instruments are so delicate in structure that they are easily broken in transport from Europe and in the factory, and are not recommended solely on that account. In order to avoid calculation and so that instruments may be comparative, it is recommended that the instrument be graduated at 84° F (instead of 60° F as in Europe) this being the average shade temperature during the

day in a factory or laboratory in this country. It was also found impossible to test the density of pure strong latex containing about 35 per cent of rubber directly, by means of the instrument, owing to the viscosity of such a latex. It is therefore recommended that in such cases, the latex be diluted with an equal volume of water and the density of the diluted latex taken. The rubber content of this diluted latex found from its density, will then be half the rubber content of the pure latex.

Uses of the Hydrometer.

The writer has found this instrument of considerable value for experimental tapping and other data; instead of having to weigh the rubber from each experimental plot and keep it separate from other plots, by measuring the volume of latex and observing its density, the rubber content can be obtained either from a table made previously for latex of known rubber content and density or preferably from a curve shewing the relationship between density and rubber content of latex and the latex bulked subsequently with that from other plots, in order to obtain a more uniform rubber for market purposes.

Secondly the instrument enables one to ascertain whether water is being added to any extent to latex in the field and to control the dilution in the factory, so that, except on a wet day the latex may be diluted with water to such an extent that its density, and hence its rubber content is always the same. In this way, very uniform results can be obtained in the preparation of smoked sheet. A satisfactory density figure at which to work is approximately 0·9898 indicating a latex containing 15 per cent or 1.5 lbs. of rubber per gallon. An instrument of the type mentioned above can be purchased from Messrs. J. J. Griffin & Sons, Scientific Apparatus Makers, Kemble Street, Kingsway, London, W.C. This firm has for some considerable time listed other hydrometers graduated for the tropics, although other firms will no doubt be able to supply similar instruments.

The dimensions of the above instrument are as follows:—

Total length of stem	8 inches.
Length of stem between graduations 0.980 and 1.000	7 "
Length of cylindrical bulb	$3\frac{1}{4}$ "
Diameter " "	$1\frac{5}{8}$ "
Total length	13 "

Price .. .. £1 2*s.* 6*d.* = $9.65

REPORT ON THE WORK OF LOCUST DESTRUCTION JANUARY 1- MARCH 15, 1914

By F. W. South.

Selangor.

At the beginning of January the State was divided into two halves and each half placed in charge of a Special Assistant with 4 conductors and a few coolies whose duty it was to keep the flying swarms under observation. The northern half extended as far south as Kuang and the southern half from Kuang to the boundary of the Negri Sembilan. Flying swarms were known at Kerling and around Ulu Yam and Kalong with others around Sungei Besi and Kajang. One small swarm was reported near Bentong in Pahang, but it and that at Kerling died out, apparently without laying any eggs. All these swarms were kept under careful observation, so that the breeding grounds might be known immediately the locusts commenced to lay their eggs. During the second half of the month large numbers of flying locusts were caught by the Malays in the Ulu Yam and Kalong neighbourhoods, the method being to shake them off bushes and trees when they were resting at night and to collect them on sacking spread on the ground below. In this way a very considerable quantity of gravid females were destroyed. The catching was discontinued on January 30th as all the insects were then known to have laid their eggs. The first batches of eggs were found in four different places at Kalong on January 22 and others were discovered in the same neighbourhood five days later.

On February 1st hoppers appeared at Kalong and on February 10th others appeared on the Sungei Besi Road. Subsequently swarms appeared at Ulu Yam, Ulu Kalong and Sungei Choh, and others in the Petaling district near Salak South, round Sungei Besi and on the Sungei Besi—Cheras Cross Road. In the northern half of the State destruction work started at Sungei Choh on February 13th, and in the southern half in the Petaling district and on the Sungei Besi Road on February 23rd. The catch during February was as follows:

Ulu Yam Bahru, Sungei Choh and Kalong ..	1229 tins	
Petaling and Sungei Besi	282 tins	11 swarms approximately

In the first fortnight of March work continued in the same centres and was completed in the northern half of the State by March 12th. During this period an additional 841 tins were destroyed in this half of the State and almost all the locusts were

caught. It was estimated that in all about 16 large swarms were dealt with though they were somewhat broken up. Of these not more than 10,000 individuals were believed to have escaped and they were so scattered that they would fall an easy prey to insect eating birds. In all 2070 tins of insects were destroyed in Northern Selangor and, unless some swarms escaped observation far in the jungle the danger of the locusts spreading into Perak should now be reduced to a minimum. It is unlikely that more than one or two swarms at the most escaped detection as the Malays searched very thoroughly in this district.

In the same period in Southern Selangor 962 tins representing approximately 12 swarms were destroyed around Sungei Besi and in the Petaling district. Unfortunately the swarms in the neighbourhood of Salak South escaped detection until they were rather advanced in age and about 5 small swarms escaped entirely as fliers. These have since amalgamated into one large swarm. On March 5th hoppers hatched out in the neighbourhood of Kajang and others appeared about the same time near Serdang.

The total catch in Selangor from February 13th to March 15th was 3314 tins representing about 65 swarms. The number of swarms is uncertain as a swarm arising from a single breeding ground often breaks up into several parts. The destruction work in Southern Selangor is still in full progress.

It may be recorded that attempts were made to destroy hoppers with poisons in the Northern half of the State, but though repeated on 5 separate occasions these attempts were unsuccessful, 25% of a swarm being the largest portion killed on any occasion. In view of the success obtained by the Government Entomologist in his original experiments, these trials cannot be regarded as conclusive and it is expected that others will be made in the Negri Sembilan.

The Negri Sembilan.

At the beginning of the month of January this State was divided up into three districts, Jelebu and Seremban comprising one, Kuala Pilah and Tampin the second and the Coast the third. In the Serembân and Jelebu districts there were no hoppers during the month and scouting for flying swarms occupied the staff in that district; at the end of the month the flying swarms were mainly confined to an area south of Seremban between the Tampin and Port Dickson roads, none were known north of Seremban at the end of the month.

In the Coast district a certain number of small swarms appeared throughout the month and were destroyed, but the destruction work carried out was less than has been necessary in any

previous month. The swarms dealt with were almost entirely confined to the neighbourhood of Tampin Linggi. The total catch for the month in this district amounted to 59 tins comprising 39 swarms. Flying swarms were scattered over the whole district, but at the end of the month the majority were in the Linggi neighbourhood.

In the Tampin and Kuala Pilah districts there were no hoppers until January 9th when on the Malacca boundary numerous small swarms entered the Negri Sembilan from a big breeding ground in the Territory near the 29th mile on the Seremban Tampin Road. This invasion continued until January 28th when all the hoppers turned into fliers. During this time 117½ tins were taken from 24 separate detachments of this one big swarm while further very large numbers of locusts are believed to have been destroyed by burning the lalang. The total catch in the district was 118½ tins from 25 swarms of which 24 were detachments from the same breeding ground. Flying swarms were recorded in the Tampin district but appeared to be flying southward towards Malacca.

The total catch in the Negri Sembilan for the month of January was 177½ tins representing 64 swarms.

During the month of February fliers only were recorded in the Seremban district, there being 8 swarms in all; of these two large swarms are believed to have come from the big breeding ground inside the Malacca boundary to which reference was made above, or if not from there from other parts of Malacca. These swarms were all confined to the country south west of Seremban.

In the Coast district the fliers were scattered in small swarms but were most numerous at the Southern end in the Linggi and Sua Betong neighbourhoods. Seven swarms of hoppers amounting to 13 tins were all that were found in this district during the month and of these 6 swarms containing 11 tins were in one place. This constituted the total catch in the State as no hoppers were found in the Tampin district.

In the first half of the month four flying swarms only were recorded in the Tampin and Kuala Pilah districts, one of which left the district. At the end of the month only one large swarm was found near Bahau railway Station.

During the first half of March only five swarms of fliers were found in the Seremban district and these were confined to the same neighbourhood as in the previous month. These swarms are expected to lay eggs in the course of one or two weeks.

In the Coast district hoppers reappeared again in some numbers in three places, Sua Betong, St. Leonards Estate and Tampin Linggi. The swarms of hoppers on St. Leonards were reported to

have been cleared up. The total catch for the fortnight amounted to 102 tins comprising 12 swarms. The flying swarms were scattered over the whole district, and numerous swarms of hoppers were hatching out at Sua Betong which it was hoped could be dealt with effectively by means of poison.

In the Kuala Pilah district one swarm of flying locusts was found, and two others were found in the Tampin district in the east corner. Two swarms of fliers were seen in Kemuning and Keru on the Malacca boundary and two breeding grounds were found just inside the Territory. Two flying swarms were also found in this neighbourhood inside the Negri Sembilan boundary.

The total catch for the period in the Negri Sembilan amounted to 292½ tins comprising 113 swarms. During the month of February hardly any swarms of hoppers were found, and judging by this the numbers of locusts in the Coast district must be diminishing. The records of flying swarms in the other districts show that these are not very numerous, and there appear to be reasonable grounds for anticipating that after the lapse of six months both the Negri Sembilan and Selangor should be fairly free from locusts and that any swarms remaining will be small, much scattered and probably confined to remote parts of the States.

OPENING UP YOUNG RUBBER.

Basal V and Single Quarter System of Tapping.

By F. G. Spring.

An account of this experiment was published in the *Agricultural Bulletin*, F. M. S., Vol. I, page 140, and the results for the first six months then given. The object of the experiment is to compare the Basal V system of tapping with that of the single Quarter (Half-herring bone), and to find out the relative amount of rubber obtained from a varying number of cuts on the Single Quarter System.

The distance of planting is 12½ × 25 feet. The number of trees in each plot is 100, and the average girth, as shown in the tables, is practically the same. As pointed out in the previous article, the slope, drainage, and nature of the soil is similar in each case. The trees were not tapped previous to the commencement of the experiment.

The following is the result of total rubber obtained for the first six months. For monthly yields, see *Agricultural Bulletin*, Vol. I, page 140.

No. of plot.	Total Rubber. lbs.	ozs.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.	Average girth 3 foot from ground.
1	68	3½	54	5½	9	15	3	15	22.59 ins.
2	94	14½	74	5½	13	9½	6	15½	21.75 ,,
3	66	9½	47	5	12	12	6	8½	21.29 ,,
4	115	14	101	3	9	15½	4	11½	22.28 ,,

Below is a list of the plots, and the results obtained for an additional five months. Unfortunately the yields of rubber are not available for the 12th month on account of new machinery being installed at that time.

PLOT 1.

SYSTEM OF TAPPING—QUARTER (HALF HERRING-BONE).

One cut 18 inches from the ground. Twenty cuts to the inch.

Every Day Tapping.

Average girth measured 3 feet from the ground at the commencement of the experiment 22·59 inches.

RESULTS FOR 7TH, 8TH, 9TH, 10TH AND 11TH MONTHS.

Time of tapping.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.	No. of trees.
15th April to 14th May, 1913.	8	13½	2	0			
15th May to 14th June ,,	15	11½	1	9			
15th June to 14th July ,,	14	4½	1	4			
15th July to 14th Aug. ,,	14	3½	1	11½			
15th Aug. to 14th Sept. ,,	18	3½	1	10			
Total ...	71	4½	8	2½	4	6	100

PLOT 2.

SYSTEM OF TAPPING—QUARTER (HALF HERRING-BONE).

Two cuts 18 inches apart. Twenty cuts to the inch.

Every Day Tapping.

Average girth measured 3 feet from the ground at the commencement of the experiment 21·75 inches.

RESULTS FOR 7TH, 8TH, 9TH, 10TH AND 11TH MONTHS.

Time of tapping.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.	No. of trees.
15th April to 14th May, 1913.	10	4½	2	7			
15th May to 14th June ,,	19	13½	2	10			
15th June to 14th July ,,	21	2	2	4			
15th July to 14th Aug. ,,	29	3	2	13			
15th Aug. to 14th Sept. ,,	21	9	3	4			
Total ...	102	0	13	6	10	6	100

PLOT 3.

SYSTEM OF TAPPING—QUARTER (HALF HERRING-BONE).

Three cuts 18 inches apart. Twenty cuts to the inch.

Average girth measured 3 feet from the ground at the commencement of the experiment 21·29 inches. Every day tapping.

RESULTS FOR 7TH, 8TH, 9TH, 10TH AND 11TH MONTHS.

Time of tapping.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.	No. of trees.
15th April to 14th May, 1913.	11	8	2	10			
15th May to 14th June ,,	14	10	2	8½			
15th June to 14th July ,,	21	0	1	4			
15th July to 14th Aug. ,,	22	9	2	9½			
15th Aug. to 14th Sept. ,,	22	10	2	4			
Total. ...	92	5	11	4	10	1	100

PLOT 4.

SYSTEM OF TAPPING—BASAL V.

One cut 18 inches from the ground. Twenty cuts to the inch.

Every Day Tapping.

Average girth measured 3 feet from the ground at the commencement of the experiment 22·28 inches.

RESULTS FOR 7TH, 8TH, 9TH, 10TH AND 11TH MONTHS.

Time of tapping.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.	No. of trees.
15th April to 14th May, 1913.	24	3½	1	11			
15th May to 14th June ,,	27	11	1	7			
15th June to 14th July ,,	32	14	1	3			
15th July to 14th Aug. ,,	47	0	1	2			
15th Aug. to 14th Sept. ,,	39	12	2	2½			
Total ...	171	8½	7	9½	9	1	100

TOTAL YIELDS FOR ELEVEN MONTHS.

No. of plot.	Total Rubber. lbs.	ozs.	Latex Rubber. lbs.	ozs.	Scrap Rubber. lbs.	ozs.	Bark Shavings. lbs.	ozs.
1	152	0½	125	10	18	1½	8	5
2	220	10½	176	5½	26	15½	17	5½
3	180	3½	139	10	24	0	16	9½
4	304	1	272	11½	17	9	13	12½

During the first six months tapping, as pointed out in the previous article dealing with this expeirment, a comparison of plots 1, 2, and 3, where the single quarter system is conducted,

reference to the tables will show that in plot 1, where there is only one cut, the amount of total rubber is 68 lbs. 3½ ozs., in plot 2, with two cuts, the amount of total rubber 94 lbs. 11½ ozs., while in plot 3, which has three cuts, the amount of total rubber is 66 lbs. 9½ ozs., and the basal V yields 115 lbs. 14 ozs.

The results from the 6th to the 12th month show somewhat similar differences, the one cut to a tree yielding less in proportion to two cuts than that for the first period, with three cuts there is a slight proportionate increase, but the two cuts continue to yield larger amounts of total rubber than one or three.

Over the period of eleven months, reference to the tables show that one cut (Single Quarter System) yields 152 lbs. ½ oz. total rubber, two cuts yield 220 lbs. 10½ ozs. total rubber, three cuts 180 lbs. 3½ ozs. total rubber while the Basal V yields 304 lbs. 1 oz. total rubber. It should be remembered that in each plot tapping is conducted every day. Judging from the above figures it is fairly clear that it is not advisable, on young trees, to have more than two cuts on the Single Quarter System, and it is very doubtful if this number can be increased even on old rubber. On the supposition that old trees have a greater reserve, and feeding capacity it would be expected that they could carry a larger number of cuts, but it must be remembered that as the girth of the tree increases, the length of the cuts are correspondingly greater.

It is noticeable in this experiment that one cut, over a period of the first eleven months' tapping, yields approximately as much total rubber as three cuts. The Basal V, far exceeds that of two cuts on the Single Quarter System, and this difference is likely to be maintained the second year, with a similar V on the opposite side of the tree. During the 3rd and 4th year, in the case of the V, it will be necesary to resort to a top V when there is a possibility of a reduction when compared with the same time of tapping on Single Quarters, but over the period of the four years it seems probable that the difference will be in favour of the V. Commencing with a top V 36 inches from the ground (see *Agricultural Bulletin*, F. M. S., Vol. 1, No. 9), and tapped for two years, or, until half the circumference of bark is removed a much larger amount of rubber is obtained than from 2 years' tapping on the Single Quarter System with two cuts.

The writer favours the Basal V if it is intended to continue on this system in which case it might be preferable to place the V say 24 inches from the latex spout, and afterwards a similar V on the opposite side of the tree, this would allow of a shorter period for working on the top Vs.

Some planters have an objection to the V on account of its spoiling the shape of the tree in the course of a few years. This may be so, but personally I have never noted this peculiarity, and if, as they say, it should have a tendency to flatten out the tree, there is no objection to this as regards difficulties of tapping, the only objection would be if it reduced the yield. The writer's experience is that the V has given a gradual increase as tapping progressed and has shown no sign of a reduction.

DEPARTMENT NOTE.

Mr. J. R. Hill, 2nd Assistant Agricultural Chemist, Department of Agriculture, Federated Malay States, Kuala Lumpur, has resigned his appointment on 18th March, 1911.

Mr. G. E. Coombs, Economic Botanist, Department of Agriculture, F. M. S. Kuala Lumpur, arrived and assumed his duties on 23rd April 1911.

Mr. H. W. Jack has been appointed Assistant Agricultural Inspector in place of Mr. P. B. Richards, who has been appointed 2nd Assistant Entomologist.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1914 and 1913.

Destination.	Exported during February, 1914.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1914.	Duty collected, 1914, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,271.55	1,289.78	2,561.33	1,537.80	1,023.53	...	4,356,284	108,376.90
United Kingdom ...	907.57	1,071.60	1,979.17	1,962.36	16.81	...	3,462,977	86,574.45
Continent of Europe ...	121.60	119.46	241.06	255.08	...	14.02	431,140	10,778.50
Ceylon	62.94	61.61	124.55	132.89	...	8.34	220,330	5,508.12
Other Countries ...	...	...	...	...	...	...	...	...
Total ...	2,363.66	2,542.45	4,906.11	3,888.13	1,040.34	22.36	8,470,731	211,237.97

KUALA LUMPUR,
6th March, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of February, 1914.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	149.	79.5	87.07	71.46	15.61	75.2	.790	72.2	.78%	...	7.67	5.53
Malacca, Durian Daun Hos.	29.906	158.	83.5	90.3	71.8	18.5	76.1	.919	...	.81	N.	.74	.59
N. Sembilan, Dist. Hospital													
Seremban	...	149.3	77.4	90.9	71.1	19.8	75.2	.789	72.0	.77	N.W.	1.87	1.13
,, Dist. Hos. K. Pilah	...	156.2	80.	...	...	...	76.8	.849	74.3	.82	...	3.89	2.12
,, ,, Tampin	...	163.3	82.	...	...	...	75.6	.771	71.3	.71	...	3.39	1.40
,, ,, P. Dickson	...	163.	82.3	88.7	74.	14.7	77.2	.837	73.8	.76	...	1.96	1.17
Pahang, ,, K. Lipis	...	...	81.	88.8	70.8	18.	75.3	...	...	...	...	6.22	2.65
Penang, ,, Penang	29.847	150.9	83.7	91.9	74.4	17.5	76.9	.838	72.3	.73	...	4.75	4.25
Perak, ,, Taiping	...	108.	82.35	94.	71.	23.	77.43	.876	...	.81	...	13.00	2.83
,, ,, Ipoh	...	...	82.49	93.	69.	24.	76.97	.852	...	.77	...	...	2.66
,, ,, T. Anson	...	...	82.08	93.	69.	24.	78.37	.920	...	.85	...	11.50	1.98
,, ,, P. Buntar	...	...	82.37	93.	72.	21.	78.09	.904	...	.83	...	10.58	.44
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	.91	2.85
Selangor, General Hospital												9.39	
Kuala Lumpur	...	120.5	80.5	90.3	69.2	21.1	76.9	.860	74.6	.82	...	7.40	1.73
,, Dist. Hos. Klang	...	...	80.9	90.4	72.0	18.4	76.1	...	...	...	...	6.27	2.93
,, ,, K. Selangor	...	...	...	91.3	72.8	18.5	...	...	...	...	...	2.26	1.18
,, ,, Rawang	...	...	...	91.7	71.2	20.5	...	...	...	...	...	8.38	3.77
Singapore, Kandang Kerbau			82.9										
Observatory	29.952	166.		92.8	68.	24.8	76.9	.844	...	.76	N. E.	3.04	1.11

THE

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PINK DISEASE.

By F. T. Brooks.

There has been a considerable development of Pink Disease in Malayan rubber estates during the last 18 months and at the present time it is the disease which requires the greatest amount of attention in many districts. Fortunately Pará rubber is one of the healthiest crops in existence even when this increase of Pink Disease is taken into consideration, and though there is occasion for particular vigilance in connection with this disease there is no ground for alarm if proper precautions are taken. Pink Disease is now notifiable (see the F. M. S. Government *Gazette* No. 3679, p. 1996, Vol. V, No. 59 of December 19, 1913).

This disease is caused by a fungus which is known scientifically as *Corticium salmonicolor* or *Corticium javanicum*. In Java where the fungus attacks various kinds of cultivated plants it is known by the Malayan name of "Djamoer Oepas."

The disease has been investigated in Java by Rant with special reference to its effect on cinchona. The officers of the mycological section of the Department of Agriculture at Kuala Lumpur have been conducting investigations into the life history and development of the fungus on rubber trees but as it will be some time before the bulletin describing the results in detail can appear, it has been thought desirable to publish this preliminary account which will deal chiefly with the means of identifying the fungus in the field and of the remedial measures which should be adopted in dealing with it.

Pink Disease has been recorded on Para rubber in Java, Borneo, Sumatra, Ceylon, Burmah, and Southern India as well as in Malaya. The disease has been reported on a great variety of other hosts amongst which are coffee, tea, and cinchona, as well as indigenous plants from which the fungus proceeded in all probability to

cultivated products introduced into these countries. The chief centres of distribution in the Federated Malay States are Southern Perak, the district around Pondok Tanjong, and Negri Sembilan. During the present year the disease has been found also in rubber estate in the northern part of Selangor. The disease develops most rapidly during periods of heavy rainfall.

Pink Disease attacks rubber trees of various ages though it is only rarely seen on trees under 2 years of age. It often begins its attack in a fork of the tree on account of the accumulation of water there, but sometimes it affects a branch in the middle. In a few cases the disease has been seen to attack the main stem. The manifestation of Pink Disease on a rubber tree is extremely variable. The disease is so-called because the fungus often causes a pink incrustation on the branches or main stem, which is more especially developed on the under or shady side. In this condition the disease is very striking and cannot be mistaken. One planter speaking in a graphic manner says that a tree affected by this form of Pink Disease looks as if it has been partly covered with carbolic tooth powder. This incrustation often cracks irregularly and the bright pink colour rapidly fades to a dingy white. There are however at least three other forms in which the fungus appears on the rubber tree. Pink Disease frequently assumes the form of white or pale pink pustules arranged more or less in lines. At other times the part of the fungus apparent on the exterior consists of fine white or pale pink strands which run irregularly downwards over the surface. These strands are sometimes so delicate that they are easily overlooked. Finally there is the *Necator* stage which was formerly looked upon as a separate fungus but is now known to be a stage in the life history of Pink Disease. The fungus in this condition consists of orange red (not pink) pustules about $\frac{1}{8}$ inch in length. Each pustule consists of a mass of spores which serve to propagate the disease. It often happens that two or more of these stages are present together, but it is important to remember that Pink Disease is by no means always pink to look at.

The spores of the fungus germinate on healthy bark especially where there is an accumulation of moisture and the mycelium which develops is entirely superficial at first. After a time it begins to penetrate the bark and when the mycelium has reached the laticiferous tissues, exudation of latex frequently begins which runs down the bark and becomes darkened as time goes on. The weeping of latex from branches is one of the surest signs of the presence of Pink Disease. On looking up into rubber trees this exudation can often be seen when it is impossible from ground level to denote any other indication of the disease. The mycelium

rapidly spreads both upwards and downwards over and through the bark causing it to rot. The fungus sometimes advances into the wood; this happens more frequently in small branches than in large ones. If the mycelium spreads in the wood the leaves of the affected branches wilt and turn brown on account of the water supply being cut off. When larger branches are attacked, the progress of the fungus in the bark may be checked by a spell of dry weather and in this case an open canker-like wound is caused, on the margins of which a callus tends to repair the injury. Sometimes the disease is entirely thrown off in this manner but one occasionally sees Pink Disease developing again over the newly formed bark which began to close the wound. Where the cankered areas have entirely thrown off the disease the region around them is frequently blackened on account of the oxidation of the rubber exuded when the disease was active.

In regard to the treatment for this disease it must be pointed out in the first place that spraying with fungicides apart from exceptional cases is impracticable and to some extent also useless. Spraying a rubber plantation with trees 30—50 ft. high is an entirely different proposition from spraying an orchard containing trees only 20 ft. or so high. There would have to be something in the nature of a revolution in spraying methods to enable a mature rubber plantation to be sprayed effectively so as to check Pink Disease. Again in view of the regularity of the rainfall in the Federated Malay States a single spraying would be useless. If spraying were to be effective at all in a climate like this it would have to be repeated at frequent intervals for it must be remembered that spraying with a fungicide is a preventative rather than a cure. Once Pink Disease has entered the bark the internal mycelium cannot be killed by spraying the exterior. It is only in the case of trees under three years of age that spraying with Bordeaux Mixture or Lime-Sulphur might be effective in this connection in the F. M. S. but on all such plantations yet seen, the writer would have advised the measures detailed below rather than spraying. Spraying would have to be undertaken as a preventive measure if there was danger that the disease would break out in epidemic form in young plantations in this country but fortunately there is yet no indication of this. In Southern India where there is a prolonged dry season spraying young trees before the coming of the monsoon has been found to check the disease.

When Pink Disease first appears in a rubber plantation it is usually distributed in a sporadic manner, *i.e.* one tree is affected here and another one there. It is of the utmost importance that the disease should be dealt with vigorously from the outset by cutting

off and burning the affected parts. In most plantations where Pink Disease appears for the first time only a few trees usually are attacked. In such cases diseased branches should be cut off at least two feet below the lowest point where there are obvious signs of the fungus and it is preferable to cut them off flush with the main stem or larger branch. In no case should "hat-pegs" be left. Unfortunately it seems difficult to induce coolies to use saws, so care should be taken to see that they cut underneath the branch before there is danger of it being severed from above, otherwise an ugly snag may be left. If the main stem of a tree is affected below the level of the lowest branches it should be cut out and burnt.

Where a large number of trees are affected on an estate the manager may think twice before he cuts out in this drastic manner. If he decides not to cut in this way, branches and main stems which appear to have a chance of recovery should be covered with tar for two feet above and below the region over which the fungus is evident. If the disease is dealt with in this way in the early stages many branches may be saved. Even when the fungus has penetrated the bark to a slight extent the external application of tar appears to check its progress. It has been urged that the diseased bark should be removed before tar is applied. That is an excellent ideal but as the coolies carry out this work imperfectly and frequently handle the affected bark so that they may be the means of disseminating the disease it is preferable to apply tar direct to the affected parts. Treated trees should be examined within a month and if the fungus has spread it must be decided whether tarring is to be tried again or whether the affected parts are to be cut out. On one estate where there was a good deal of Pink Disease the manager checked its progress by giving two applications of tar when necessary at intervals of a month. If two applications were found useless the affected parts were then cut out and burnt. In certain cases, *e.g.* when the leaves of a branch have wilted because the fungus has entered the wood, it is obviously hopeless to apply tar. The only thing to do in such cases is to cut out and burn the diseased portions. If tar is applied to check Pink Disease it is essential that the work should be done under good supervision, otherwise the money will be wasted.

Planters sometimes have difficulty in burning diseased branches on account of persistent rain. If it is impossible to burn the diseased parts directly they should be drenched with a 10% solution of Sulphate of Copper, removed from the plantation and buried in the ground some distance away from the rubber trees. It must always be remembered however that there is nothing so good as fire for the destruction of fungoid pests. In this connection mention

should be made of the fact that another pink fungus (*Oospora gilva*) which is harmless, usually develops on wood in this country a few days after it has been burnt. This fungus has been more than once mistaken for Pink Disease.

Where Pink Disease has appeared in an estate a pest gang should be formed if it is not already established and the size of the pest gang should be such that it can go over the whole estate once every three or four weeks. Pink Disease develops rapidly and any longer interval is too great to allow of it being dealt with effectively. The expense of maintaining a pest gang is considerable but this must be met. The whole of the rubber plantation industry is dependent upon the health of the trees so it would be suicidal policy to grudge money for treating disease. Fortunately directors, agents, and managers are alive to this fact.

It sometimes happens that native holders in the neighbourhood of European estates do not clear up pests and diseases on their properties as do the managers of the latter. Such neglect in the case of Pink Disease is doubly serious and it is to be hoped that the Agricultural Pests Enactment will compel offenders to do their duty.

Any plants besides rubber which are found to be affected by Pink Disease in the neighbourhood of estates should be destroyed. The disease has been seen in this country on Cocoa, Coffee, Gardenia, Hibiscus, Horse Mango, Camphor, "Langsat," Lime, Durian, Jak, and a species of Senna. Ridley reported it some years ago on Ramie and *Strobilanthes*. There is one doubtful record of it occurring on a jungle tree. Planters and others would be doing a service if they would be good enough to report the occurence of Pink Disease on any other hosts besides rubber. The manifestations of the disease on other plants are the same as those on rubber.

If the measures indicated above are carried out the disease should be kept under control but any neglect of it will be dearly purchased. As a disease of rubber trees it is more common in this country than the "die-back" caused by *Diplodia* and it is undoubtedly a disease which will have to be watched most carefully. *Diplodia* often enters wounds caused by Pink Disease and increases the injury.

THE LONDON RUBBER EXHIBITION.

It was decided towards the end of 1913 that Malaya should be represented by exhibits at the International Rubber and Allied Trades Exhibition to be held in June 1914.

The F. M. S. Government agreed to subscribe a sum of £1000 provided the Planters' Association of Malay gave its support by obtaining contributions from estates to an equal amount.

As in the case of the last Exhibition in New York, it was decided to remit the export duty in the case of all exhibits sent from estates to represent to collective exhibit from the Federated Malay States.

The Planters' Association of Malaya decided to support the exhibition and arrangements were left in the hands of the Director of Agriculture.

It was decided that all exhibits except those sent by estates for competition purposes should be sent through the Department of Agriculture. Estates were circularised by the Director of Agriculture with the result that samples were received from 83 estates including, 36 in Selangor, 24 in Perak, 12 in Negri Sembilan, 2 in Pahang, 3 in Province Wellesley, 3 in Malacca and 3 in Johore. This does not include several estates whose exhibits were received too late and were returned. A number of estates appear to have sent their exhibit direct through their own London Agents.

The cases were opened at the Department of Agriculture and inspected by the Director of Agriculture and the Agricultural Chemist.

About six cases were rejected for various reason. Most of the samples were of good appearance, but the smoked sheet—with one or two exceptions—was rather mixed in character.

It would appear more difficult to prepare a product of standard *appearance* with smoked sheet than in the case of pale crepe. A number of samples had suffered from bad packing.

All the rubber was unpacked and repacked under the supervision of Mr. Lambourne, Superintendent of Government Plantations, and shipped per S. S.   consigned to the Malay States Information Agency London. Each case was numbered, and inside each was placed a label giving the name and head office address of the Company, the local address of the Estate and the grade and weight of the rubber.

The total amount of rubber forwarded, apart from special samples prepared by the Agricultural Chemist, was 28,166½ lbs. The following is a list of the contributing estates tabulated under different grades:—

Name of Estate.	Smoked Sheet.	No. I Crepe.	Lower Grade Crepes.
1 Batu Caves	130 lbs.	107 lbs.	105 lbs. Scrap Crepe Blanket.
2 Bukit Jelutong	166		
3 Bungsar	100		
4 Highlands	1,000	161	161 lbs. each of Nos. 2, 3 and 4.

Name of Estate.	Smoked Sheet.	No. I Crepe.	Lower Grade Crepes.
5 Jugra Lands	100	100	100 lbs. each of No. 3, best scrap and earth scrap.
6 Seafield	120	105	100 lbs. each of bark scrap and best scrap.
7 Jugra	103		100 lb. and 102 lb. of best scrap and bark scrap.
8 Glenmarie	100	100	
9 Serendah		100	100 Best scrap crepe.
10 Balgownie		153	153 Earth bark scrap (No. 6), 145 Bark scrap (No. 4), 151 Earth scrap (No. 5), 144 Scrap crepe, 140 Lump crepe.
11 Inch Kenneth		126	148 lbs. Lump scrap (No. 2).
12 Kajang		121	140 Lump crepe.
13 Glenshiel		142	152 Lump crepe.
14 Dominion		130	Earth Scrap crepe 146, 143½ Lump crepe, 138 Scrap crepe, 136½ No. 2 Lump crepe, 142½ Bark scrap crepe.
15 Kent	100	100	100 Lump crepe, 100 Bark crepe, 100 Earth crepe.
16 Ledbury	400		
17 Kepong	380		
18 Changkat Asa		114	
19 St. Andrews	100		
20 West Country		126	140 Bark scrap, 140 Bark shavings.
21 Sungei Puloh	190		140 Bark crepe, 140 Scrap crepe.
22 Pilmoor	100		
23 Bute	125		
24 Jalan Acob	100	100	
25 Puchong		350	
26 Bukit Rajah	100	100	100 Scrap crepe.
27 Seaport		125	
28 Kuala Selangor	209	151	
29 Lapan Utan	120		
30 Sungei Tua	100		
31 Shelford	100		100 Best scrap crepe.
32 Harpenden		120	120 Scrap crepe.

Name of Estate.	Smoked Sheet.	No. I Crepe.	Lower Grade Crepes.
33 North Hummock			100 Scrap crepe.
34 Braunston		115	115 Best scrap crepe.
35 Dusun Durian		200	
36 Jebong		134	
37 Krian Rubber Plantations	390		207 Bark shavings crepe, 299 Scrap, 118 Lump crepe.
38 Goodheart	105		
39 Cicely		157	Scrap 119.
40 Trong		145	
41 Ratanui		130	
42 Klabang	191		102 lb. Tree scrap crepe 103 Earth ,, 100 Bark ,, 109 Lump and Cup washing crepe.
43 Castleton		818	
44 Kota Bharu	337		Bark crepe 105lb. Scrap 233lb.
45 Hendra	100		
46 Kota Tampan	121		
47 Changkat Salak	100		
48 Straits Rubber Co	112	112 (smoked)	Lump crepe 112 lb, bark scrap 113.
49 Gula	120	120	Bark scrap 240 lb.
50 Canning	146		
51 Kamuning	100	100	No. 2 Crepe 100 lb.
52 Klian Kellas	116		
53 Gapis	147		Bark screpe 164, scrap crepe 166.
54 Sengat	100	100	
55 Batak Rabit		142	Bark scrap 162.
56 Bernam	100		
57 Ayer Kuning	107	109	Bark crepe 127, scrap crepe 122.
58 Tali Ayer		100	Best scrap crepe 100.
59 Sungei Krian	140		
60 Senawang	100		No. 2 Crepe (shavings) 100lb., earth scrap crepe 100lb.
61 Leigh			Scrap crepe 360lb.

Name of Estate.	Smoked Sheet.	No. I Crepe.	Lower Grade Crepes.
62 Siliau	150	110 110 (Artifici- ally	Tree scrap 110lb., bark scrap 110lb.
63 Ulu Rantau	200		
64 Sagga		130	Lump crepe 125lb., cup washing crepe 110lb.
65 Gan Kee	300		
66 St. Leonards	200 200	200 (Smoked crepe)	Washed crepe (No. 2) 192½.
67 Sendayan		150	No. 2 crepe 100.
68 Cheviot		125	Virgin crepe 125.
69 Labu		125	Bark crepe 125.
70 Linggi (Rantau Div.)		350	
71 Sikanaty	160		
72 Semambu	300 (hand made)		
73 Gali	336		
74 Alma	100		
75 Bukit Toh Alang	100		
76 Caledonia		130 133 Thick crepe.	No. 2 crepe 140lb.
77 Bukit Kajang	758	465 258 Blanket	
78 Cheng	700		
79 Malaka Pinda	140		
80 Mount Austin	300	145	
81 Jementah	320		Scrap crepe 120lb., Tree scrap crepe 120lb.

Nos. 1-35 are estates in Selangor, 36-59 in Perak, 60-71 in Negri Sembilan, 72 and 73 in Pahang, 74-76 in Province Wellesley, 77-79 in Malacca and 80-81 in Johore.

The following grades not included in the above were also sent:—

Bujong Estate (Selangor)

No. 1 Block 105½ lbs. No. 2 Block 102 lbs. No. 3 Block 102 lbs.

Lanadron (Johore) Block 100 lbs.

Bukit Kajang Special Worm 589 lbs.

Total smoked sheet, 10,639 lbs. No. 1 crepe, 7,523 lbs. Lower grade crepe, 8,694 lbs. Block rubber, 409½ lbs. Special worm, 589 lbs. Smoked crepe, 312 lbs.

The only sample of unsmoked sheet was rejected on account of tackiness.

SPECIMENS PREPARED AND COLLECTED BY THE AGRICULTURAL DEPARTMENT.

Para Rubber.

Smoked and unsmoked biscuits; crepe from latex untreated and also treated with sodium bisulphite, unsmoked sheet prepared from latex with and without addition of sodium bisulphite, smoked sheet ditto., rubber coagulated on the Derry machine, rubber prepared in sheet by coagulating latex in shallow trays, specimen of latex preserved by addition of formalin, samples of freshly coagulated lump and sheet before and after machining, and samples of crepe with and without sodium bisulphite, freshly machined, bark shavings, naturally coagulated lump, freshly machined bark shavings and scrap crepe. All of these samples were sent in formalin solutions.

Camphor.

Specimens of crude and sublimed camphor; also camphor pressed into cakes, and camphor oil, prepared at the Experimental Plantation from Cinnamonum Camphora (Japanese Camphor tree).

Para Rubber Seed Products.

Sample of oil pressed from crushed seed in a screw press, and sample of the residual cake, rubber seed kernels.

Lallang Fibre.

Specimen of "half-stuff" prepared by C. ffolliot Pears Esq. of Tampin Linggi Estate.

Coconuts, Coconut Oils and Other Oil Products.

Coconut oil and Gingelly oil and specimens of cake, Coconuts unhusked (10 kinds) Coconuts husked (10 kinds), and one cati of copra.

Fibres.

Agave species, Agave Rigida var, Sansiviera Zeylanica, Furcraea, coconut spinning fibre, coir matting, coir mattress fibre, and coir yarn.

Gutta Percha, and Other Rubbers.

Taban merah (block), Taban puteh (block) Taban merah (ball), Getah Rambong (ball), Getah gerit (lump).

Drugs, Spices, Dyes, Etc.

Dragons blood (cake). Dragon's blood (ball). Fruits of dragon's blood extracted and untreated. Ipecacuanha root, White and black pepper, Cloves, Turmeric, Star Anise, Ginger, Cinnamon bark and leaves, Cardamoms, Anise seed, Poppy seed, Nutmegs, Mace, Coriander, Tamarind, Palmyra sugar, Chillies, Gula Kelapa, Gula Malacca, Indigo seeds (I. arrecta). Coconut sugar, Kapok, Pickles (5 kinds).

Botanical Specimens.

Rubber seed, rubber seed for germination; rubber seeds showing different stages of germination, Indigofera sumatrana, Indigofera arrecta, Cinnamonum camphora, Pachouli, Coffee robusta, Coffee liberica, Lemon grass, Citronella grass, rubber seedlings at different ages, rubber stumps, young coconut and rubber plants.

Photographs.

A large series of photographs illustrating nearly every phase of a rubber plantation, many views of other cultivations and illustrating life and conditions in Malaya were sent for enlargement. A number of stereoscopic views was also sent.

Maps.

Maps of Selangor, Perak, Negri Sembilan and Pahang, also the same with the positions of exhibiting estates marked with numbers.

Rotans.

Specimens of rotan—Manau, getah, ayer, batu, jernang, kerai, tanah, udang, sega, sega ayer, semambu, ribu, manur.

Rubber Tapping Exhibits.

Rubber trees (3 trunks), latex cups, tapping knives.

Models.

Model of Castleton Estate factory, coolie lines at Castleton Estate, Manager's bungalow and Smoke house, Pondok Tanjong Government Estate are being constructed in England for the exhibition.

Malay Basket Work, Etc.

Specimens of Malay hats and baskets, and the materials from which these are made (Pandan leaves) from Port Dickson, Malacca etc.

Trengganu Exhibits.

A fine collection of silk and other sarongs made in Trengganu also a large collection of white metal ware obtained through the British Adviser.

L. Lewton-Brain.

LOCUST SPRAYING EXPERIMENTS.

H. C. Pratt.

The following experiments were conducted in Negri Sembilan during the latter part of 1913. The poisons used were:—

London Purple, Paris Green, Arsenite of soda. For the experiments the Four Oaks Knapsack Sprayers were used. The first four experiments are not recorded, as the Mandor, through a misunderstanding, removed the sheeting which enclosed these sprayed areas.

In order to discover the most effective proportions, as well as the cheapest, small gatherings of locusts were enclosed within sheeting in the field. Subsequently experiments were tried under field conditions. See Nos: 5, 18, 19, 20, and 21.

Experiment No. 5.

A field experiment no enclosures, Arsenite of Soda 1 lb: dissolved by boiling in one gallon of water to which was added two gallons of water for use.

An open area of about 1600 square yards on the side of a hill was sprayed with this solution.

The ground was covered with thick grass and there were blukar and lalang present. Driving would have been attended with great difficulty.

Spraying was done in front of the swarm *i.e.* ahead of the direction in which they were moving between the hours of 9 a.m. and 1 p.m. Heavy rain occurred at 3 p.m.

Result:—70% dead at 5 p.m. the same day.

Experiment No. 6.

London Purple 1 lb., water 25 gallons, mixed with cold water. An enclosure of 12 square yards was sprayed with this mixture at 8.15. a.m. At the time of spraying the locusts

were in thick coarse grass over ground in which it would not have been feasible to drive them. There was a strong sun and but little rain fell during the day.

Result :—95% were alive in this enclosed area at 5.10 p.m. the same day while at 8. a.m. the next morning 50% were dead.

EXPERIMENT No. 7.

London Purple 1lb. water 25 gallons mixed with cold water, and to which were added 3 lbs. of Molasses. The locusts were enclosed in an area of 12 square yards, and spraying was conducted at 10.45. a.m. in hot sun. There was not a great deal of grass, and most of it was short. Only a little rain fell after the area had been sprayed.

Result :—95% were alive at 5.15. p.m. the same day and 60-70% were dead at 10. a.m. on the next day.

EXPERIMENT No. 8.

London Purple 1lb., water 50 gallons mixed with cold water, and to this were added 6 lbs. of Molasses. The locusts were enclosed in an area of 12 square yards and spraying was conducted at 11.15. a.m. in the hot sun. They were in short sparse grass and there was but little rain after spraying.

Result :—95% were alive at 5. p.m. on the same day and about 70% dead at 10. a.m. the next day.

EXPERIMENT No. 9.

London Purple 1 lb., water 12 gallons mixed with cold water and to which were added 4½ lbs. of Molasses. The locusts were enclosed in an area of 12 square yards over which there was a fair amount of short grass. Spraying was conducted at 11.45. a.m. in the hot sun. There was not much rain after spraying.

Result :—About 70% were dead at 5.10. p.m. on the same day and on the next day 100% at 10. a.m.

EXPERIMENT No. 10.

London Purple 1 gallon, water 6 gallons, mixed with cold water to which were added 4½ lbs. of Molasses. The locusts were enclosed in an area of 12 square yards and over this there was a fair amount of short grass. Spraying was conducted at 10.15. a.m. in the hot sun. There was but little rain after spraying.

Result :—About 75% dead at 5.20. p.m. on the same day and about 98% dead the next morning at 10. a.m.

EXPERIMENT No. 11.

Arsenite of Soda 1lb. dissolved by boiling in 1 gallon of water, which was diluted for use with 1 gallon of water. The locusts were enclosed in an area of 12 square yards which was sparsely covered with short grass. Spraying was conducted at 10.30. a.m. in hot sun. Only a little rain fell after spraying.

Result:—About 90% dead at 5.30. p.m. the same day. All dead at 8. a.m. the next day.

EXPERIMENT No. 12.

Arsenite of Soda 1 lb. dissolved by boiling in 1 gallon of water which was diluted for use with 8 gallons of water. To this were added 3 lbs. of Molasses. The locusts were enclosed in an area of 12 square yards which was sparsely covered with short grass. The solution was sprayed within the enclosure at 11.20. a.m. in hot sun. Only a little rain fell after spraying.

Result:—About 70% were dead at 5 p.m. the same day, and 98% dead at 11 a.m. the next morning.

EXPERIMENT No 13.

Arsenite of Soda 1 lb. dissolved by boiling in 1 gallon of water which was diluted for use with four gallons of water. To this were added 3 lbs. of Molasses. The locusts were enclosed in an area of 12 square yards which was sparsely covered with short grass. The solution was sprayed within the enclosure at 11.25. a.m. in the hot sun. Only a little rain fell after spraying.

Result:—Practically 100% dead at 5.10. p.m.

EXPERIMENT No. 14.

Arsenite of Soda 1 lb. dissolved by boiling in 1 gallon of water which was diluted for use with two gallons of water. To this were added 3 lbs. of Molasses. The locusts were enclosed in an area of 12 square yards which was sparsely covered with grass. The solution was sprayed within the enclosure at 11.40. a.m. in the hot sun. Very little rain fell after spraying.

Result:—Practically 100% dead at 5. p.m.

EXPERIMENT No. 15.

Paris Green ½lb. water 3 gallons mixed with cold water to which were added 2 lbs. of Molasses. The enclosed area was sprayed at 11. a.m. on a dull day. There was a little rain at 11.30. a.m. The enclosed area was well covered with grass.

Result:—90% alive at 5.20. p.m. the same day and 90% dead at 9 a.m. the next day.

EXPERIMENTS 16 & 17.

Two experiments with Paris Green at the same rate as experiment 15 and with the same amount of Molasses. Two areas of 12 square yards were enclosed and sprayed at 11 a.m. in the hot sun. There was plenty of suitable grass within the enclosures. Hoppers of 5th instar. At 3.30 p.m. a very heavy rain commenced and it continued to rain heavily for 3 hours.

Results:—At 8.30. a.m. about 70% of the enclosed locusts were alive. Some were developing wings which would account for their not feeding.

EXPERIMENT NO. 18.

Arsenite of Soda 1 lb. dissolved by boiling in 1 gallon of water to which were added 2 gallons of water for use. An open area on the side of a hill, about 1 acre in extent was sprayed with this solution between the hours of 9 and 11 in the morning in the hot sun. There were blukar, thick grass, shrubs and lallang, a place where driving would have been attended with considerable difficulties. There was heavy rain at 3. p.m. at 3. p.m.

Result:—In the evening at 5. p.m. it was apparent that about 70% of the swarm were dead. Next morning there were very few live hoppers.

EXPERIMENT NO. 19.

Arsenite of Soda 1 lb. dissolved in 1 gallon of water diluted with 4 gallons of water for use. To this were added 1½ lbs. of Molasses. The locusts covered about 4 acres but were not in dense masses over this area. It was however a fairly large swarm. Surrounding the locusts were lalang and blukar while the ground over which they were scattered had very little grass. For this experiment, two Four Oaks sprayers were used; a belt of grass 5 or 6 yards wide was first sprayed round the swarm. The inner area was then sprayed. Spraying was conducted between the hours of 8. a.m. and 11. a.m. in hot sun. There was very heavy rain at 3. p.m.

Result:—At 1 p.m. same day many dead. At 5 p.m. the same day practically all the swarm dead.

EXPERIMENT NO. 20.

Arsenite of Soda 1 lb. dissolved by boiling in 1 gallon of water diluted with 4 gallons of water for use. To this were added 2 lbs. of Molasses. High lalang on the railway bank was

sprayed with this solution the lalang at the time being full of 4th instar locusts.

Result:—Next morning no sign of living locusts. A few dead ones were found on the ground but owing to the thick lalang and the fact that the locusts had probably scattered it was difficult to find many dead. The swarm was a large one.

EXPERIMENT No. 21.

Paris green 1 in 6, Molasses 2 lb. sprayed over lalang and grass which was swarming with locusts.

Result:—Only a few dead ones found the next day.

EXPERIMENT No. 22.

Bran, Arsenite of Soda, and Molasses tried in form of baits, and spread about the field amongst a swarm of hoppers.

Result:—Negative.

The above experiments show very definitely the most effective poison of those which have been tried. They may thus be summarised.

London Purple including Experiments 6, 7, 8, 9, 10.

It will be seen from these that the proportions were respectively 1 in 25 without Molasses, 1 in 25 with Molasses, 1 in 50 with Molasses, 1 in 12 with Molasses, and 1 in 6 with Molasses. From the results obtained it is apparent that the mixtures of 1 in 12 and 1 in 6 were the only ones likely to prove of any value in the field.

Paris Green, including Experiments 15, 16, 17.

The proportion of Paris Green in these three experiments was 1 in 6 with Molasses. Experiment No. 15 shows an interesting result. It must however be borne in mind that the locusts, being enclosed had no option but to eat the poisoned grass. It is slow in its effect.

Arsenite of Soda including Experiments 5, 11, 12, 13, 14, 18, 19, and 20.

The proportions were respectively as follows:—

The stock solution represents 1 lb. Arsenite of Soda in one gallon water.

1 gallon stock solution 2 gallons water without Molasses.
1 gallon stock solution 1 gallon water without Molasses.
1 gallon stock solution 8 gallons water with Molasses.
1 gallon stock solution 4 gallons water with Molasses.
1 gallon stock solution 2 gallons water with Molasses.
1 gallon stock solution 2 gallons water without Molasses.
1 gallon stock solution 4 gallons water with Molasses.
1 gallon stock solution 4 gallons water without Molasses.

It will be noticed that the cheapest and most effective solution is 1 in 4 with the addition of Molasses, *i.e.* Experiment 13, 19, 20. which include two field experiments.

The cost per gallon of these poisons in this country would be approximately as follows:—

Paris Green	1 in 6	6 cents per gall.
London Purple	1 in 6	3-4 cents per gall.
Arsenite of Soda	1 in 4	3 cents per gall.

Thus the Arsenite of Soda besides being the most effective is the cheapest.

With efficient nozzles one knapsack sprayer containing 4 gallons of this solution should cover about 400 square yards so that it would require 12 sprayers full to the acre, and one coolie under normal conditions should be able to spray this in one day. The time required and amount of solution used will naturally depend upon the nature of the growth to be sprayed, lalang and blukar would need at least twice the amount of poison, and take longer to spray. It should not, however, for the poison itself, cost more than $2.00 per acre of sprayed ground of this class and the average not more than $1.60.

Spraying is undoubtedly effective but care must be taken in using a strong solution of Arsenite of Soda. Spraying areas within Kampongs, if adopted, will be attended with danger. The locusts could certainly be surrounded before the grass is sprayed but some caution must be taken with regard to the dead bodies. In a Kampong the fowls would devour these. It might be feasible to make the Malays changkol over the ground and bury the dead locusts before or immediately after the sheeting has been removed. They would, however, have to be buried fairly deep.

I do not recommend poisoning in a kampong where driving is easy.

Spraying should be started in the early morning and a ring of grass, lalang or whatever the locusts are feeding on poisoned round the swarm or in front of the direction in which they are treavlling.

There can be no definite rule for dealing with swarms. The field conditions must decide this point.

All the nozzles should be of uniform size. That producing a very fine mist is the most effective and economical. I found the Four Oaks Sprayers satisfactory.

There are two drawbacks to the use of Arsenite of Soda. 1. It makes the tips of the fingers under the nails very sore. It is not possible to avoid the hands getting wet. This might be overcome by the use of cheap water proof gloves. 2. Arsenite of Soda cannot be sprayed on foliage that must not be killed.

It has however great advantages. First it is very effective, and secondly the fact that the grasses die very rapidly after the solution is sprayed upon them acts as a preventive to cattle grazing over the poisoned area, nor is the grass of any use for fodder.

An important consideration was the difficulty attending the boiling in the field. Small quantities could be mixed but to obtain large quantities entailed much waste of time.

If the Arsenite of Soda is well ground up there is no necessity to boil the water in order to dissolve the Arsenic. It is quite soluble in cold water. The easiest way to mix the solution on the field, would be by taking 1 lb. to 5 gallons of cold water, stirring well for 10 minutes and then spray with this solution. It is essential to grind the Arsenite of Soda into a powder.

RUBBER YIELDS FROM DIFFERENT PERIODS OF TAPPING.

By F. G. Spring.

The object of this experiment is to compare the yields of rubber obtained from every day tapping with that of alternate month, alternate week, and tapping one day in seven. The systems conducted in the various plots are described underneath.

PLOT 1.

Every Day Tapping.

System—Single Quarter (Half Herring Bone).

Two cuts 18 inches apart. No. of trees 100.

Average girth of the trees, measured 3 feet from the ground, at the commencement of the experiment 21·75 ins.

PLOT 2.

Alternate Month Tapping.

System—Single Quarter (Half Herring Bone).

Two cuts 18 inches apart. No. of trees 100.

Average girth of the trees, measured 3 feet from the ground, at the commencement of the experiment 21·42 ins.

PLOT 3.

Alternate Week Tapping.

System—Single Quarter (Half Herring Bone).

Two cuts 18 inches apart. No. of trees 100.

Average girth of the trees, measured 3 feet from the ground, at the commencement of the experiment 21·85 ins.

PLOT 4.

One Day in Seven Tapping.

System—Double V, cuts 18 inches apart. No. of trees 100.

Average girth of the trees, measured 3 feet from the ground, at the commencement of the experiment 21·91.

The plots are adjacent to each other, and the trees under similar conditions, the slope, drainage, and nature of the soil being practically the same. The growth of the trees is most uniform, the average girth, in each plot, being over 21 inches and under 22, a variation of ·49 of an inch from the lowest to the highest girth. Fortunately no trees were destroyed during the period of tapping referred to in the tables.

It should be noted that in plots 1, 2, and 3 (every day, alternate month and alternate week tapping) the system adopted is two cuts on the Single Quarter, but in plot 4 (tapping one day in seven) a Double V is used.

In plots 1, 2, and 3, which are strictly comparable, reference to the tables will show that every day tapping yields approximately three times as much rubber as that of alternate month, the former giving 178 lbs. 8 ozs. total rubber, and the latter 61 lbs. 6½ozs. total rubber.

With every day tapping slightly less than double the amount of bark has been removed as compared with alternate month consequently every day tapping yields considerably more rubber per area of bark removed.

An interesting feature in connection with alternate month tapping is that the daily yields of rubber at the commencement of each tapping month are small, but gradually increase towards the close of the month. The small yields obtained for a number of days on each occasion after the trees were rested for a month may be due to the bark having dried up to a certain extent or the irregular tapping, in all probability a combination of the two.

With alternate week tapping the yield of total rubber is about half that of every day, to a certain extent in proportion to the area of bark removed; at the commencement of each tapping week the yields are smaller than that at the end of the week but there is not such a large variation as with alternate month.

Tapping one day in seven, for the first ten months, gives very poor yields as compared with every day tapping, and by no means in proportion to the area of bark removed, but during the 9th and 10th month there is a very distinct increase but even if this increase were to continue to such an extent as to give comparatively goods results in later years, I am afraid that the extremely small yields likely to be obtained for the first year or so would render it

unsatisfactory. A planter cannot very well afford to adopt a system which will probably give 12 to 16 lbs. of rubber per 100 four years old trees for the first year, while with other systems 200 lbs. is not uncommon.

Reference to the tables will show that February of 1913 was a dry month, and with the exception of one day a week tapping it is noticeable that the yields of latex rubber are lower than that of the previous months, this reduction is most noticeable in alternate month and alternate week tapping.

Time of Tapping.	PLOT 1. Every Day Tapping.				PLOT 2 Alternate Month Tapping.				PLOT 3. Alternate Week Tapping.			
	Latex Rubber		Scrap.		Latex Rubber.		Scrap.		Latex Rubber.		Latex Rubber.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
15 Oct. to 14 Nov. 1912	11	2	1	13½	12	9½	1	14	10	5	1	6
15 Nov. to 14 Dec. ,,	17	0	1	13					11	4½	1	5½
15 Dec. to 14 Jan. 1913	13	3	2	3½	11	8½	3	4½	9	3½	1	4½
15 Jan. to 14 Feb. ,,	10	12½	2	7					7	14	1	9½
15 Feb. to 14 March ,,	9	14	2	4¼	5	10½	3	1½	5	0	1	14½
15 March to 14 April ,,	12	6	3	0					4	8	1	6
15 April to 14 May ,,	10	4½	2	7	5	4½	2	14	3	2½	1	9
15 May to 14 June ,,	19	1½	2	10					3	12	1	15½
15 June to 14 July ,,	21	2	2	4	12	4	2	15	9	3	1	9
15 July to 14 Aug. ,,	29	3	2	13					7	3	1	6
Total	154	12½	23	11¼	47	5	14	1½	71	7½	15	5½

PLOT 4.

Tapping One Day in Seven.

Time of Tapping.	Latex Rubber. lbs.	ozs.	Scrap. lbs.	ozs	Rainfall.
15 Oct. to 14 Nov. 1912		5½		1½	Oct. 1912,
15 Nov. to 14 Dec. ,,		4¼		1¾	Nov. 1912, 14·26 inches.
15 Dec. to 14 Jan. 1913		8½		2¼	Dec. 1912, 11·95 ,,
15 Jan. to 14 Feb. ,,		7		2	Jan. 1913, 10·46 ,,
15 Feb. to 14 March ,,		10		2¼	Feb. ,, 3·72 ,,
15 March to 14 April ,,		15½		3	Mar. ,, 11·69 ,,
15 April to 14 May ,,		7½		2¼	Apr. ,, 11·02 ,,
15 May to 14 June ,,		12½		3	May ,, 8·10 ,,
15 June to 14 July ,,	1	9		4	June ,, 3·77 ,,
15 July to 14 Aug. ,,	2	9¼		3	July ,, 2·63 ,,
Total	8	9½	1	9	

	Plot 1		Plot 2		Plot 3		Plot 4	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
Latex Rubber ...	154	12½	47	5	71	7½	8	9½
Scrap Rubber ...	23	11½	14	1½	15	5½	1	9
Total ...	178	8	61	6½	86	13	10	2½

The yield of rubber from bark shavings is not given.

THE AVOCADO OR ALLIGATOR PEAR.

By J. Lambourne.

This fruit is produced on *Persea gratissima*, Gaertn, a medium sized tree belonging to the order Laurineae. This order contains a number of genera natives chiefly of the warmer countries of both hemispheres; the order is almost wholly unrepresented in the Temperate Zone. The genus *Persea* contains about 100 species, natives of tropical America and the Old World. Although so many species are known *P. gratissima* which is a native of S. America seems to be the only one which bears edible fruits worthy of note. The timbers of several species are valuable on account of their durability.

The tree on which the Avocado,—or Alligator Pear, is borne, is of medium size, attaining, in countries where it thrives, to the height of from 25 to 30 feet. The bark is comparatively smooth, and gray on the trunk, and older parts of the branches; and smooth and green towards the tips. The branches are stout and, as a rule, are produced nearly to the base of the trunk. The leaves are alternate, broadly lanceolate, acute, narrowing towards the base to a short leaf stalk. They are about 8 inches to one foot in length, about three to four inches wide, coreaceous and shining above, paler and dull below, and quite glabrous. The flowers are greenish in colour and disposed in panicles which are borne in the axils of the leaves near the tips of the young branches. The perianth tube is short and the limb segments 6 in number are almost equal, or the three outer ones smaller. The Stamens are nine in number and perfect. The ovary is downy ripening into a large pear-shaped green drupe containing one large seed.

The fruit in outward appearance bears the strongest resemblance to a very large green pear. The fleshy part of the fruit surrounding the seed,—which is about the size of a walnut,—is greenish yellow in colour, and of the consistency of firm butter. It has a fine flavour of fresh walnuts which when eaten raw with pepper and salt or lime juice is very delicious.

The Avocado Pear is now cultivated in most warm countries but does not receive the attention it deserves. In Southern California and Mexico the fruit is common in the markets as it is also in the W. Indies. The tree grows and fruits well in Southern India, Ceylon and also in parts of the Straits and F. M. S. but it is not so widely cultivated as it might be. This fruit, if more extensively cultivated in this country, would form a welcome addition to our present somewhat scanty collection of salads.

The Avocado Pear is easily propagated from seed or cuttings of half ripe wood. After being planted to permanent quarters, the plants appears to require very little attention beyond being kept clean from weeds and an occasional mulching of manure, when grown on very poor soil.

A few trees about 6-7 years of age fruited recently on the Expt. Plantation Kuala Lumpur. These trees are growing on a hill side, in rather poor laterite soil where they are growing well and looking remarkably healthy. They are about 12 ft. in height and produced a heavy crop of fruits; upwards of one hundred were obtained from one tree. I have also heard of the Avocado pear fruiting well in Negri Sembilan and in Singapore so there appears to be no reason why this fruit should not be more extensively grown throughout the Peninsula.

MINUTES OF THE PLANTERS' ASSOCIATION OF MALAYA.

Annual General Meeting, held at 10.30 a.m. on April 26th 1914, at the Chamber of Commerce, Kuala Lumpur.

Present: Mr. R. W. Munro (Chairman)
„ H. C. E. Zacharias (Secretary) and

From Bagan Datoh D. P. A. Mr. J. Milne Counsel
„ R. H. W. Davidson
„ R. G. Bayley

„ Batang Padang D. P. A. „ F. J. Ayris,
„ W. H. Tylden Patterson,
„ J. M. P. Landon

„ Batu Tiga D. P. A.	„ T. J. Cumming
	„ J. Grieve
	„ H. L. Jarvis
	„ W. S. Reeve Tucker
„ Johore P. A.	„ W. N. Gawler
	„ H. H. Ramsay
„ Kapar D. P. A.	„ J. G. Cruickshank
	„ L. Mooijaart
	„ E. W. Harvey
	„ V. D. French
	„ E. A. Ash
	„ C. Henly
	„ W. R. H. Brock
	„ R. K. Walker
	„ W. H. King-Harman
„ Kajang D. P. A.	„ K. G. Furley
	„ O. P. Dakeyne
	„ C. Burn-Murdoch
	„ E. G. Leyne
„ Kelantan P. A.	„ G. W. Templer
	„ H. Greme Anderson
„ Klang D. P. A.	„ G. H. Bennett
	„ E. C. Wakefield
	„ W. D. Magill
	„ S. C. Yoemans
	„ A. E. Chapman
From Kuala Langat D. P. A.	„ G. C. Ash
„ Kuala Lumpur D. P. A.	The Hon. Mr. E. B. Skinner
	Mr. R. M. Skinner
	„ A. Turton
	„ G. Allan Grant
	„ H. Armstrong
	„ J. A. Baird
	„ F. Clyde Jeavons
	„ A. Shelton Palmer
	„ F. G. Harvey
	„ Wm. Fraser
	„ C. J. Arnold
	„ Ronald J. Rogers
	„ A. Keightley Smith
	„ D. G. Gardner
	„ C. W. Jones
	„ G. D. van Someren

,,	Kuala Selangor D. P. A.	,,	Thos. H. Menzies
		,,	G. C. Bailey
		,,	J. M. Booth
,,	Lower Perak D. P. A.	,,	Maurice Maude
,,	Malacca P. A.	,,	J. W. Campbell
		,,	E. A. Barbour
,,	Malay Peninsula Agr. Ass.	,,	F. Duncan Hindley
,,	Negri Sembilan P. A.	,,	J. D. McCulloch
		,,	V. A. Tayler
		,,	F. J. Lloyd
		,,	A. Dupuis Brown
,,	Ulu Selangor D. P. A.	,,	M. D. Fallon
		,,	F. W. Davies

Hon. Members: Mr. E. Macfadyen, Mr. L. Lewton Brain (Director of Agriculture), Mr. E. S. Hose (Acting Controller of Labour), Dr. C. L. Sansom (P.M.O.) and Mr. R. W. Munro.

Visitor: Mr. A. K. E. Hampshire.

Mr. *Barbour* proposes that the Central Perak Planters' Association be formally affiliated, as from Jan. 1st, 1914.

Mr. Macfadyen seconds this proposal, which is carried unanimously.

LONDON (1914) EXHIBITION.

The Secretary reads the following correspondence:—

Kuala Lumpur,

" Staines Manders Esq., 10th February, 1914."

" Dear Sir,

Reverting to your letter of Sept. 4th, I am instructed to inform you that this Association have appointed Mr. H. M. Darby of Malacca, and Mr. H. E. G. Solbe of Batu Tiga, to be their Delegates at the forthcoming London Exhibition to be held next June."

" Believe me &c.,
(Sgd.) H. C. E. Zacharias.
Secretary."

The *Secretary* reports that Johore had contemplated, during the last month or two the advisability of having a separate stand at the Exhibition, but that after some correspondence with the Chairman of the Johore P. A. the project had been dropped.

Kelantan on the other hand, he understood, was proceeding with a separate stand of their own at the said Exhibition.

CONGRESS OF TROPICAL AGRICULTURE.

The *Secretary* reads the following correspondence, which is approved of:—

International Congress of Tropical Agriculture,
London, 1914.

"Imperial Institute,
London, S. W.,
5th January, 1914."

"Dear Sir,

The International association for Tropical Agriculture has arranged to hold its Third International Congress at the Imperial Institute, London, S. W. in June, 1914. A Circular, dealing with the organization of the Congress and tne subjects to be discussed, is enclosed. The Congress is being organised by the British Section of the International Association, which includes among its members the principal agricultural Officers in the British Colonies and Protectorates.

You will see that one of the chief objects of the congress is the discussion of problems in tropical agriculture and forestry and in the economic development of tropical countries.

As your Members will be interested in these problems the Organising Committee for the Congress hopes that your Committee will render assistance by (1) subscribing* to the funds of the Congress, (2) appointing one or more delegates to attend the meetings and take part in the discussions and (3) bringing the congress to the notice of the members.

Additional copies of the preliminary circular can be supplied if required."

"We are, dear Sir,
Yours faithfully,
(Sgd.) Thomas A. Henry
Harold Brown.
Hon. Organising Secretaries to the Congress."

"The Secretary,
Planters' Association of Malaya."

"Kuala Lumpur, 10th February, 1914."

"The Hon. Organising Secretaries of the Third International Congress of Tropical Agriculture, Imperial Institute, London, S. W."

"Dear Sirs,

I beg to acknowledge receipt of your circular of the 5th ulto., which I have submitted to my Committee, by whose instruction I now beg to enclose our application for membership and P. O. for £1-0-0.

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* "Societies subscribing not less than £5 to the funds of the Congress will be included in the official list of donors, which will be printed in the programme to be publinhed before the opening of the congress."

Mr. H. M. Darby of Malacca, who proposes to be in London at the time, has been appointed as our delegate."

"Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary."

"INTERNATIONAL CONGRESS OF TROPICAL AGRICULTURE.
LONDON, 1914."

"Imperial Institute,
London, S. W.,
9th March, 1914."

"Dear Sir,

We have to acknowledge, with many thanks, the receipt of your letter dated the 10th February enclosing a postal order for £1 as a subscription for membership of the Congress of Tropical Agriculture. A formal receipt is attached.

We note that Mr. H. M. Darby of Malacca has been appointed to represent your Association at the Congress."

We are, etc.,
(Sgd.) Thomas A. Henry
,, Harold Brown
Hon. Organising Secretaries."

"The Secretary,
The Planters' Association of Malaya.

BATAVIA CONGRESS.

The *Secretary* lays on table handbooks and pamphlets relating to this Rubber Congress and Exhibition and reads the following correspondence:—

"Kuala Lumpur, 10th February, 1914."

W. E. van Rijnberk Esq.,
Singapore.

Dear Sir,

I thank you for your favour of 23rd ulto. and now beg to inform you that my Committee have met in the meantime and decided upon the conditions to be attached to the £50 cup to be presented by this Association, viz:

"For any exhibit of Plantation Para, of whatever grade or form (in lots of not less than 100 lbs.), which attains the highest standard on the basis of the proposed R. G. A. evalauation tests."

I need perhaps not enlarge on the great importance of placing the sale of rubber on a basis of its intrinsic value to manufacturers, as against that of its apparent value, hitherto in vogue, and I am glad that the Batavia Exhibition will be the first, at which at least one prize will be awarded on this principle.

My Committee also wish me to enquire whether such tests can be carried out in Java, and if not, how your Committee would suggest dealing with the matter, both from the practical and the financial point of view.

Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.
"Kuala Lumpur, 8th April, 1914."

H. C. E. Zacharias Esq.,
Secretary, The Planters' Association of Malaya,
" Dear Sir,

I beg to refer to your letter dated 10th of February, of which I had sent a copy to the Standing Committee at Batavia, but to my regret I did not receive a reply as promptly as I expected and I therefore wrote them once more. They now write me that they are not aware of the R. G. A. regulation tests, and that they would feel very much obliged if through me, you could let them have a copy of the R. G. A. regulations. Anyhow, I am instructed to inform you that a complete laboratory will be fitted out at the Exhibition, where chemical and physical rubber tests will be made and there will also be a complete vulcanization plant for testing purposes. I therefore take it for granted that although the R. G. A. rules are not known yet, we shall be able to carry out the necessary tests at the Exhibition.

Yours faithfully,
(Sgd.) W. E. Van Rijnberk,
Hon. Secretary for The Singapore Sub-Committee,
I. R. C. E., Batavia, 1914.

W. E. van Rijnberk Esq.,
Singapore.
Dear Sir,

I thank you for your favour of the 23rd ulto. and enclosure.

The tests referred to in my letter of Feb. 10th as "the proposed R. G. A. evalauation tests" are those proposed by Dr. Schidrowitz and adopted by the Standardization Committee of the Rubber Growers' Association. Dr. Schidrowitz has publicly declared (vide *India Rubber Journal* of Feb. 28th 1914) that the exact nature of these tests will shortly be published in the ordinary way in the scientific and technological press, but that in the meantime he is quite ready to give full information on the subject to any bona-fide inquirer.

The simplest way of obtaining the necessary data would therefore seem, for your Committee to address Dr. Schidrowitz direct.

Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

"Office of the Director of Agriculture
Federated Malay States,
16th March, 1914."

No: 7 in 520/1913.

'Sir,

"BATAVIA EXHIBITION."

I have the honour to inform you that the Federated Malay States Government has consented to the use of models, photos, etc., obtained for the London Exhibition also at Batavia. There will however be no Federated Malay States Government Exhibit at Batavia, but one collected by the local Committee.

I am also informed that the Federated Malay States Government will pay the actual expenses together with a small allowance for incidental expenses to both the official and unofficial delegates."

"I have, etc.,
(Sgd.) B. J. Eaton,
for Director."

The Secretary,
The Planters' Association of Malaya,

Mr. *Munro* reviews the progress made with this Congress and bespeaks the support of all planters. The Congress and Exhibition were being organized with characteristic thoroughness and, he had no doubt, would form an invaluable opportunity for all interested in the actual production of rubber of exchanging views and learning something new.

They now had to appoint three delegates and he would propose Mr. Macfadyen as one of them.

Mr. *Macfadyen* regrets being unable at this hour to state definitely his ability to attend. He would therefore suggest the appointment of Messrs. Munro, E. B. Skinner and Zacharias.

These delegates were elected.

REPRESSION OF DRUNKENNESS.

The *Secretary* reads the following correspondence:—

"Kuala Lumpur, 16th January, 1914."

The Under Secretary, F. M. S.,

'Sir,

"Repression of Drunkenness."

I have the honour to revert to my letter of July 21st., to which I am as yet without a reply, and to state that at a meeting of this

Association held on the 11th inst., I was instructed further to submit that beer be included in the definition of "spirituous liquor."

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Klang District Planters' Association.

"Klang, 12th March, 1914."

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Dear Sir,

I am instructed to write to you to the effect that this Association is of opinion that Government be asked to place some restriction on the sale of beer to Tamil Coolies.

I am, etc.,
(Sgd.) A. N. Symons,
Hon. Sec., K. D. P. A.

Mr. *Macfadyen* would like Mr. Skinner to tell them, how far this matter had gone.

The Hon. Mr. *E B. Skinner* said the Government were elaborating a system for the restriction of the total amount of toddy produced and for the regulation of its standard. As regards other spirits, further legislation was also contemplated, and he would not be surprised, if the question of beer was also going to be dealt with at a very early date.

Labour Code.

The *Secretary* reports having sent out the following circular, as instructed:—

"Kuala Lumpur, 16th January, 1914."

Dear Sir,

As you are no doubt aware the Labour Code defines in Sect. 40 a place of employment as one on which ten or more (free) Indian Immigrants are employed.

This Association has been all long of opinion that this provision is highly injurious to the planter, who recruits his labour from India, and has therefore tried to obtain an amendment of the law. In reply we have now been told that sufficient grounds have not been advanced for such alteration and as a result of a discussion on this subject at our last meeting held on the 11th inst. I was instructed to write to all constituent Associations, asking for

their views and for concrete examples of the unfairness of this provision.

I shall be glad to hear from you accordingly and thanking you in anticipation for any assistance that your members may be able to give.

I am, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

The replies so far came to hand, contained however no concrete examples of the unfairness of this provision.

Mr. *Mooijaart* asks why the definition was ever changed. In the old Enactment of 1908 it was defined as any place where employment was carried on by and on behalf of an employer. He would instance the case of a Chinese owning five or six kampongs, each of $5\frac{1}{2}$ to 6 acres and employing 6 coolies—30 or 40 altogether. He got round the law by registering one kampong in his own name, one in his wife's, one in his son's, and so on.

Mr. *Tayler* thinks the matter an important one which should be proceeded with. Government should be urged to amend the clause, not because there was any hardship in concrete cases, but because the whole principle was wrong.

Mr. *Hose* would remind the meeting, that the provisions of the Labour Code with regard to crimping applied equally to all persons, whether employing less than ten labourers or not, and it was always open to employers to proceed against such persons accordingly.

As regards the change made, it seemed probable to surmise that it had been decided upon, in order not to impose upon employers of such a small number of labourers as less than ten all the restrictions and obligations of the Labour Code.

The Hon. Mr. *E. B. Skinner* points out it had been the practice in Krian for many years to allow coolies to go off during slack seasons to work on native holdings growing padi, so that there was a good deal to be said for the Enactment as it stood at present as regards the north. In amending it therefore there should be anyhow a general principle of granting exemption to certain areas. What happened as a rule was that coolies absconded, went to those small holdings, and after a month or so they went to some other and bigger estate, where they were taken on the strength of their tale of having worked on the small holding. That was how they evaded the law.

Mr. *Macfadyen* says it was practically impossible to convict a small employer of crimping and they relied for equalising the matter on the incidence of immigration assessment. If there was

really a sense of grievance as to the operation of the limit imposed it seemed right they should press the question.

Mr. *Counsel* says that the position in Krian was on the face of it a special case and that it seemed unreasonable to shape the whole law to apply to one solitary special case. He considers that the matter should be gone into and proposes "that the matter be referred to the Standing Committee to take such steps as they may deem desirable."

Mr. *Barbour* seconds this motion, which is carried unanimously.

"INDIAN IMMIGRATION COMMITTEE."

The *Secretary* reads the following correspondence, which is received with applause, *re* the payment of local transport by the Indian Immigration Committee and *re* the reduction of Agents' charges:—

"Office of the Controller of Labour,
S. S. and F. M. S.,
Kuala Lumpur, 23rd February, 1914."

No. 13 in 579/1913.

Sir,

I have the honour to forward for the information of the members of your Association a copy of a letter from the Deputy Controller of Labour, Penang, to Messrs. Kennedy and Company dated the 11th instant, and a copy of Messrs. Kennedy and Company's reply thereto dated the 16th instant.

I have, etc.,
(Sgd.) E. S. Hose,
Ag: Controller of Labour, F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

"Labour Office,
Penang, 11th February, 1914."

No. 7 in 1170/1913.

Gentlemen,

I have the honour to inform you that your letter dated the 3rd February on the subject of your Agency charges in connection with the forwarding of coolies to estates was laid before the Indian Immigration Committee at the meeting held at Kuala Lumpur on the 6th instant.

2. The Committee understand that the terms on which your Company are now prepared to undertake the business of handling and forwarding coolies on their arrival from India are as follows:—

A. Charges to be made if coolies are taken delivery of at the depot gates:—actual cost of feeding plus an Agency charge of 25 cents per cooly. The Agency fee is to be reduced to 15 cents in any month in which more than 100 coolies are dealt with for one employer and to 10 cents in any month in which more than 200 coolies are dealt with for one employer.

B. Charges to be made if coolies are forwarded to place of employment:—as above with an additional fee of 25 cents per cooly. This additional fee is to be reduced to 15 cents in any month in which more than 100 coolies are dealt with for one employer and to 10 cents in any month in which more than 200 coolies with passenger fares and telegrams are to be recovered from the Deputy Controller of Labour, Penang, but no extra charges to be allowed for watchmen etc.

3. Although these charges are higher than those made by Messrs. Boustead Hampshire & Co., the Committee realise that the business of entraining coolies at Penang involves closer supervision than at Port Swettenham and that the volume of your business is not so great as that of Messrs. Boustead Hampshire & Co. in this respect and they are therefore prepared to recommend employers through the Planters' Association of Malaya to accept the terms now offered.

4. It is understood that this arrangement will take effect on the coming into operation of the Committee's proposal to pay local fares from the Immigration Fund.

5. I shall be obliged if you will be so good as to confirm these proposals in writing.

I have, etc.,

(Sgd.) E. W. F. Gilman.

Deputy Controller of Labour, Penang, and
Secretary, Immigration Committee.

Kennedy & Co.,

Penang, February 16th, 1914.

The Deputy Controller of Labour,

Penang, and Secy.,

Immigration Committee, Labour Office, Penang.

Sir,

"Agency Charges."

We have the honour to acknowledge receipt of your letter No: 7 in 1170/1913 dated the 11th instant for which we thank you.

We take note that your Committee are prepared to recommend the acceptance of the terms set out in our letter of the 3rd inst. and your reading of which we beg to confirm.

We have, etc.,
(Sgd.) Kennedy & Co.

Office of the Controller of Labour
S. S. and F. M. S.
Kuala Lumpur, 24th February, 1914.

No: 5 in 618/1913.
Sir,

With reference to my letter of even number dated the 18th December last on the subject of Messrs. Boustead Hampshire and Company's charges for feeding and distributing Indian Immigrants who have received free passages from India, I have the honour to inform you that Messrs. Boustead Hampshire and Company have introduced the lower scale of charges referred to in the said letter with effect from the 1st January last, notwithstanding that the proposal of the Immigration Committee to pay the train and bus fares of labourers to their destinations has, owing to unforeseen circumstances, not yet come into operation.

2. I shall be obliged if you will convey this information to the members of your Association.

I have, etc.,
(Sgd.) E. S. Hose,
Ag. Controller of Labour, F .M. S.

Secretary,
Planters' Association of Malaya.

Kuala Lumpur, 10th February, 1914.

The Hon'ble,
The Colonial Secretary, S.S.,
Singapore.

"LABOUR CODE."

Sir,

I have the honour to draw your attention to the fact that an amendment to this Code, now incorporated in Sect. 161, II, b, 2, was passed at the last meeting of the Federal Council of these States.

The Indian Immigration Committee, however, are unable to carry out the provisions of this amendment, which represents the unanimous wishes of the whole planting community, pending the passing of analogous legislation in the Straits Settlements.

I therefore have the honour to submit that this matter is one of great hardship on all contributors to the Indian Immigration Fund and to urge that the necessary legislation be carried through the Legislative Council of the Colony at the earliest possible date.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

Colonial Secretary's Office,
Singapore, 21st February, 1914.

Misc. 868/1914.

Sir,

I am directed to acknowledge the receipt of your letter of the 10th instant on the subject of an amendment of the law regarding the transport of labourers and to inform you that the amendment is now being considered by the Legislative Council of this Colony.

I have, etc.,
(Sgd.) S. W. Arthur,
for Colonial Secretary,
Straits Settlements.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

Office of the Controller of Labour,
S. S. and F. M. S.,
Kuala Lumpur, 15th April, 1914.

No: 7 in 618/13.

"Sir,

With reference to my letter of even number dated the 15th November 1913, I have the honour to inform you that the amendment to the Straits Settlements Tamil Immigration Fund Ordinance enabling the Indian Immigration Committee to pay local railway, steamer and bus fares of assisted immigrants to their places of employment was passed by the Legislative Council on the 27th March 1914.

2. The payment of such local fares will take effect from the 1st proximo, and I enclose for the information of members of your Association copies of notices that have been sent to the Deputy Controllers of Labour at Penang and Port Swettenham, who have been instructed to distribute copies to all employers importing Indian labourers.

I have, etc.,
(Sgd.) E. S. Hose,
Ag: Controller of Labour, F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur.

NOTICE TO EMPLOYERS OF INDIAN LABOURERS WITH ASSISTED PASSAGES TO PENANG.

From and after 1st May, 1914, all expenses incurred

(*a*) in the landing of assisted immigrant labourers at Penang,

(*b*) in the despatching of telegrams by estate agents at Penang to employers stating the number of labourers received in the depôt; and

(*c*) for all train, steamer, and motor-bus fares of such immigrants travelling from the depôt at Penang to their places of employment, will be paid out of the Indian Immigration Fund.

2. From the above date tickets will be issued, free of charge, on the order of the Labour Officer in charge of the depôt for all assisted immigrant labourers travelling by train from Penang to their places of employment.

3. Feeding charges incurred in the depôt will continue to be paid by employers directly or through their agents.

4. In the case of those employers who have appointed agents to pay the feeding charges, and also to despatch the labourers to their places of employment, the steamer or motor-bus fares of the labourers will be disbursed in the first instance by the agents, and will be recovered by them from the Indian Immigration Fund.

5. In the case of those employers who have appointed agents to pay the feeding charges, but make their own arrangements to take delivery of labourers at the depôt, an account of the steamer or motor-bus fares of the labourers (exclusive of the person sent to receive them from the depôt) should be sent to the Labour Office at Penang.

6. In the case of those employers who have not appointed agents either to pay the feeding charges or to take delivery of the labourers the feeding charges must be paid at the depôt before the labourers are allowed to leave. The Labour Department cannot undertake to advance these charges or to be in any way responsible for the payment of them. The person sent to take charge of the labourers should be given sufficient funds to pay the feeding expenses incurred, which can be calculated from the date of the arrival of the labourers in the depôt and the probable date on which he will arrive to take charge of them. The cost of feeding an adult in the depôt at Penang is 8 cents per day. The day of

arrival of the labourers in the depôt should be counted as one day. Receipts will be given by the Food Contractor for all payments made. An account of the steamer or motor-bus fares of the labourers should be submitted as stated in paragraph 5 above.

7. In order to avoid unnecessary delay in payment, statements of accounts should be sent to the Labour Office within seven days of the arrival of labourers on their place of employment.

8. Further information, if required, can be obtained from the Deputy Controller of Labour, Penang.

KUALA LUMPUR, *6th April, 1914.*

E. S. HOSE, *Acting Controller of Labour, F.M.S.*

NOTICE TO EMPLOYERS OF INDIAN LABOURERS WITH ASSISTED PASSAGES TO PORT SWETTENHAM.

From and after 1st May, 1914, all expenses incurred

(*a*) in the landing of assisted immigrant labourers at Port Swettenham,

(*b*) in the despatching of telegrams by estate agents at Port Swettenham to employers stating the number of labourers received in the depôt, and

(*c*) for all train, steamer and motor-bus fares of such immigrants travelling from the depôt at Port Swettenham to their places of employment, will be paid out of labourers received in the depôt, and

2. From the above date tickets will be issued, free of charge, on the order of the Labour Officer in charge of the depôt for all assisted immigrant labourers travelling by train from Port Swettenham to their places of employment.

3. Feeding charges incurred in the depôt will continue to be paid by employers directly or through their agents.

4. In the case of those employers who have appointed agents to pay the feeding charges, but make their own arrangements to their places of employment, the steamer or motor-bus fares of the labourers will be disbursed in the first instance by the agents, and will be recovered by them from the Indian Immigration Fund.

5. In the case of those employers who have appointed agents to pay the feeding charges, but make their own arrangements to take delivery of labourers at the depôt, an account of the steamer or motor-bus fares of the labourers (exclusive of the person sent to receive them from the depôt) should be sent to the Labour Office at Klang.

6. In the case of those employers who have not appointed agents either to pay the feeding charges or to take delivery of the labourers the feeding charges must be paid at the depôt before the

labourers are allowed to leave. The Labour Department cannot undertake to advance these charges or to be in any way responsible for the payment of them. The person sent to take charge of the labourers should be given sufficient funds to pay the feeding expenses incurred, which can be calculated from the date of the arrival of the labourers in the depôt and the probable date on which he will arrive to take charge of them. The cost of feeding an adult in the depôt at Port Swettenham is 13½ cents per day. The day of arrival of the labourers in the depôt should be counted as one day. Receipts will be given by the Food Contractor for all payments made. An account of the steamer or motor-bus fares of the labourers should be submitted as stated in paragraph 5 above.

7. In order to avoid unnecessary delay in payment, statements of accounts should be sent to the Labour Office within seven days of the arrival of labourers on their place of employment.

8. Further information, if required, can be obtained from the Deputy Controller of Labour, Klang.

KUALA LUMPUR, E. S. HOSE,
6th April, 1914. *Acting Controller of Labour, F.M.S.*

NEWSPAPER AGITATION.

The Secretary reads the following correspondence:—

Kuala Lumpur,
Federated Malay States,
No: 2 in 10096/13. 17th February, 1914.

Sir,

I have the honour to refer to your letter dated 10th October, 1913 regarding an article entitled "Indian Coolies in the Federated Malay States" which appeared in the July number of the *Indian Review*. As I verbally informed you the Government did not consider that with the information before it any good purpose would be served by requesting the Indian Government to take action even if the article were held to be actionable.

2. The article in question contained statements generally very similar to and in some cases identical with statements which were contained in certain anonymous letters and petitions which came to the notice of the Government and the Government of India has already been furnished with a report on these allegations.

I understood from you that the Planters' Association was collecting material with a view to preparing a reply to the *Indian Review* allegations and I shall be glad to know how the matter now stands.

I have the honour, etc.,
(Sgd.) E. L. Brockman,
Chief Secretary, F. M. S.

The Secretary,
Planters' Association of Malaya,
Kuala Lumpur, 23rd February, 1914.

The Hon'ble the Chief Secretary, F. M. S.,
Kuala Lumpur.

Sir,

I have the honour to acknowledge receipt of your letter No. 2/10096 of the 17th inst.

As you will have seen from the Minutes of our Meetings, Mr. C. T. Ambika Pat Rai has undertaken to investigate the position of the Indian Labourer in this country and will publish a pamphlet on the results of his enquiry.

The pamphlet is now ready and is being forwarded by this week's mail to Madras, where it will be published by the Brahmavedin Press. The English edition should reach us in about six weeks' time, whilst a Tamil Edition is to follow.

A short article by Mr. Rai on the same subject is, I understand, being published in the March number of the *Indian Review*.

This Association is subscribing for a number of these pamphlets of which I shall have the honour to send you a copy, as soon as they reach me.

I have, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

He regrets the dilatoriness of the Madras printers, they ought to have received these pamphlets in ample time for this meeting. Under the circumstances there was nothing for it now, but to send them out together with the Minutes of the present Meeting.

JAVANESE LABOUR.

The *Secretary* reports that, as instructed, the Standing Committee had at their Meeting held on Feb. 7th duly considered the claim of the Labour Association Ltd. for the patronage of this Association and had decided the same in the negative.

MARKETING OF RUBBER.

The *Secretary* reads the following correspondence:—

Kuala Lumpur, 16th January, 1914.

Messrs. The Manhattan Rubber Mfg: Co.,
18 Vesey St.,
NEW YORK.

Dear Sirs,

I thank you for your letter of the 12th ulto., which I read out at the last General Meeting of this Association held on the 11th

inst. Further publicity is given to your letter through the fact that practically all the newspapers in the Peninsula are reproducing it in full in their reports of the meeting, and I may add that all speakers at the said meeting were very strongly in favour of consumer and producer being brought into direct relationship and of the present mischievous system of antagonistic middlemen being done away with.

I therefore trust that the publicity thus afforded will result in a number of plantation companies opening up correspondence with your direct and that this lead to business which I am sure can but be mutually profitable.

Believe me, etc.,
(Sgd.) H. C. E. Zacharias,
Secretary.

THE MANHATTAN RUBBER MANUFACTURING CO.

New York, March 18th, 1914.

Secretary,
Planters' Association of Malaya,
Dear Sir,

We wish to thank you for the courtesy extended in your letter of January 16th which is in reply to a letter by Mr. Townsend the President of this Company, dated December 12th, 1913.

It may interest you to know that as a result of the trouble you took in connection with Mr. Townsend's letter, we have received from Malaya one letter from an estate offering to ship us rubber direct,—two letters from general merchants, offering to act as Agents for us and two letters from Chinamen, offering to sell us Plantations.

We have replied to the Estate offering to sell us direct and to one of the merchants, asking them to forward us samples of their rubber in sufficient quantities so that we may make thorough test. In the event of the rubber proving satisfactory, we will go further into the matter of making direct purchases.

Yours very truly,
The Manhattan Rubber Mfg. Company,
(Sgd.) A. S. Hardy,
Manager, Foreign Department.

Mr. *Barbour* remarks that, as they all knew, Managers were not free Agents, and the sale of the rubber produced by them was a matter which in most cases lay not in their hands at all. The position seemed to him an unfortunate one and he pleaded for greater latitude.

Mr. *Munro* quite agrees with these remarks and would mention that the first direct steamer had lately cleared Port Swettenham for New York; and he hoped this ship would be the forerunner of many and that there by the practice of direct dealings between the producer in this country and the consumer in America would firmly be established.

CHAIRMAN'S REPORT.

Mr. *Munro* tables his report for 1913/4 and moves its adoption.

The Hon. Mr. *E. B. Skinner* seconds the motion.

Mr. *Macfadyen* feels reluctantly obliged to move an amendment to this motion, as he had to dissent from some sentences towards the end of the report. Before doing so, however, it gave him the greatest pleasure to be able to congratulate the Chairman on the excellent report he had presented. It appeared to him to contain fuller and more interesting information than any previous report, and to be a perfect model of the way in which that information should be set out. He thought they could congratulate themselves further on the general tone in which it is possible for a report of this kind to be presented to the Association at this moment.

As regards standardization, he wished to refer to the installation of a vulcanizing plant in Kuala Lumpur by the Agricultural Department.

It was really amusing to read the correspondence on this subject for months at Home between the wise-acres of the rubber industry and the Napoleonic speeches of one chairman after another, the result of all of which had hitherto been nil. Yet in Kuala Lumpur in less than twelve months they had succeeded in getting established a thoroughly up-to-date testing station which in a very short time would be doing its work. Whether all the advantages they expected would follow remained to be seen, but at any rate they could claim that in Kuala Lumpur a serious effort had been made, and the only one hitherto made, towards that kind of standardisation which did appear possible in connection with the sale of rubber.

He also must thoroughly agree with the Chairman's appreciative remarks on the recent developments in the matter of the Planters' Loan Fund; and he only hoped that this Fund would gradually be turned into a great Agricultural Bank.

Another subject touched upon in the report was the incidence of taxation. It was time, that the heavy direct charges on land, imposed at a time of temporary excitement, and which had certain-

ly operated, and would do so more and more, as a handicap on the development of the land of this country, were removed. The vice of the heavy quit rents on land had always appeared to him that they played into the hands of the large capitalist, making it very easy for him to obtain large areas of land and tie up the development of the country for a long time to come, whereas the small capitalist was prevented from acquiring a sufficient amount of land to develop his enterprise.

With regard to the export duty he entirely agreed it would be a great advantage to have a uniform rate of duty for all grades, pointing out that it would remove the necessity to break open cases, which it would become increasingly necessary for Customs officers to do as more rubber was exported and the revenue from that source became more important to Government. It would also, he held, be a further advantage to them in that it would raise the percentage of higher grades (applause).

The main point, and one raised by the Chairman in regard to the export duty, was that Government ought now to promise not to collect duty when rubber fell below a certain price. No body could object to export duty seriously so long as prices were high enough to make the business extremely remunerative. Other countries, were finding however that export duty could not be collected when the export of rubber ceased to show a profit, because it simply killed the business. Government should recognize that here, and a promise on that point would be of the utmost value to those connected with the further development of the rubber industry in this country (applause).

Referring to the favourable position of the country in regard to labour, he would remind the meeting of the new procedure under which committees would, in certain eventualities, confer with Health Officers. He believed something in the nature of this procedure had been suggested, at an early stage of the controversy over the health question by Sir Edward Brockman, at all events, in the form finally adopted, they might hope that the existence of an appeal to such committees would save them in future from "irksome and unnecessarily stringent action" such as, in his opinion, they had justly complained of in the past. The new procedure would perpetuate the improved relations between planters and the Sanitary authorities.

The amendment he desired to move was the omission from the report of the passages dealing with the subject of Discharge Tickets; as he felt he must protest against the implication contained in those paragraphs that a legalized discharge ticket system would mean an attempt at re-introducing indentured labour. He

did not for one moment believe it would. He must also protest against the inference which was to be deduced from a later sentence that registration fees would penalise local recruiting in a manner which would have the same result. He did not for one moment believe that practices would be restored to which would make the freedom of the cooly illusory. He entirely agreed that the rubber industry had been built up on labour which was absolutely free. The only freedom the cooly would lose would be the freedom he at present enjoyed of disregarding all his obligations to his employer (applause).

This was not a matter on which he wished to cause a division of opinion in the Association, but he could not forget that it was only about a year ago since, at the instance of that Association, a Committee was sitting, partly composed of Government officials and partly of members of that Association, discussing this very question. That Committee elaborated a scheme under which he believed the legitimate freedom of the coolie would have been amply protected, and at the same time the legitimate interests of the employer would for the first time have received recognition. He supported that proposal and could not now vote for the adoption of a report in which the principles on which it was based were condemned. And in so far as the report was adopted and in that way became the report of the Association, he thought it would be very unfortunate that this should go out to the world as the recorded opinion of the Association on the question of discharge tickets, because he believed firmly that the majority of planters throughout the country were in favour of a system of legalized discharge tickets.

He believed the chairman, like himself, had long advocated a system of voluntary discharge tickets and could only take it he believed the legalization of the discharge ticket would make all this difference. He moved as an amendment that the paragraphs indicated be deleted (applause).

Mr. *Cruickshank* seconds the amendment. He, together with Mr. Macfadyen, had been a member of a special Commission, appointed by Government, to report on the advisability of introducing a system of discharge tickets on the Ceylon lines. That Commission had fully gone into the subject and, with one exception, all the planting members had been unanimous that such a system was not only necessary, but also quite feasible. A great deal had been said about restricting the liberty of the coolie, but nothing concrete could be brought forward. The liberty of the coolie would remain the same as now; discharge tickets would merely give employers a chance of tracing those who tried to get out of their legal respon-

sibilities, by providing a ready means of establishing the identity of the whole labour force employed in the Peninsula. Surely this was a most reasonable request to make, and he must disassociate himself completely from the statements to the contrary made in the Chairman's Annual Report. He therefore had much pleasure in seconding Mr. Macfadyen's amendment.

Mr. *Campbell* is also anxious to identify himself with the amendment. The question was a practical one and could be proved, not merely by academic discussions, but by actual experience. The Discharge Ticket system had been voluntarily introduced in Malacca and was there working splendidly. Why should its result be different, if generally introduced? There was no question of limiting the freedom of the coolie at all. All that was needed was a legal provision that no coolie should leave the country or get employment, until he produced his discharge ticket.

Mr. *Mooijaart* considers a further definition of the proposed system necessary. Without this, it seemed impossible to say whether the freedom of the coolie was being limited or not. He had before him a scheme proposed in 1908 by a P. A. M. sub-committee appointed ad hoc; this was definite enough, but he did not know, whether this system was still being advocated now.

The Hon. Mr. *Skinner* repeats that he, for one, was no believer in Discharge Tickets, for reasons he had stated often. One point, alone, seemed quite sufficient reason to him, and they all seemed to forget this, namely that it would be playing into the hands of the coolie, as it would strengthen him in getting work elsewhere. He need only say he was going to India, get his ticket and then, sure as anything, he would sell it for cash to a shopkeeper. They would practically be placing themselves in the hands of the coolie and the shopkeeper and the employers would be worse off than ever. By the very nature of things, discharge tickets would tend to become a marketable instrument—just as had been the experience of other countries.

Mr. *Barbour* was sure that such abuse could easily be stopped by attaching the man's photo to his discharge ticket. He quite agreed with Mr. Campbell as to the successful working of the system in Malacca; the only drawback was that their system of tickets did not extend to Negri Sembilan and vice versa. He hoped the arrangement would be made a reciprocal one between the two countries anyhow.

Mr. *Burn-Murdoch* quite fails to understand how people could claim that preventing a coolie from leaving the country, as and when he liked, that providing a most elaborate passport system with the holder's photograph &c.; that all these and similar

measures were not a most effectual restriction of the freedom of the individual.

Mr. *Munro* sums up the discussion on his Report. He thanks Mr. Macfadyen for his kind opening remarks and wishes to say how much he was indebted to others, officials and planters alike, for the information he had been able to gather together in this report.

As regards the question of Discharge Tickets, he had only expressed his personal opinion, of course, and much regretted to see, how much this differed from that of those present. One thing he must emphasize and that was that during the past year a totally new situation had arisen through the attempt made to influence Indian public opinion adversely against the treatment of their compatriots in this Peninsula. This attempt had partially succeeded, in as much as it had rendered India very suspicious of the least movements of theirs over here, and it had partially failed, because the allegations were so utterly untrue. He would ask them whether it was politic at such a juncture to advocate any system which seemed to interfere seriously with the personal liberty of the Indian subject over here or whether it was not his duty as their Chairman to say nothing in his official pronouncements which could in any way be construed adversely or would at all militate against recruiting. He therefore much regretted the whole discussion, and, still more, the proposed amendment.

The amendment is then put to the vote and declared carried.

The report, subject to the amendment, is adopted.

Accounts.

Mr. *Munro* proposes that the Accounts presented for the year ending March 31st 1914 be passed.

Mr. *Macfadyen* seconds the motion, which is carried unanimously.

Chairman.

Mr. *Munro* announces that the only candidate for the Chair was Mr. Macfadyen, who had been nominated by the Batang Padang, Batu Tiga, Central Perak, Johore, Kajang, Kapar, Kelantan, Kuala Langat, Kuala Lumpur, Kuala Selangor, Lower Perak, Malacca, Malay Peninsula Agricultural, and Ulu Selangor Associations.

This unanimity obviated the necessity of a ballot and he therefore had now great pleasure in declaring Mr. Macfadyen duly elected as chairman for the current year.

It was at the same time his pleasing duty to congratulate Mr. Macfadyen on his recent appointment to the Federal Council, a

distinction all Members of this Association were delighted to see conferred on one who had their confidence in so striking a measure.

Mr. *Munro* vacates the Chair, which is taken by The Hon'ble Mr. E. Macfadyen, who thanks the Association for the honour done him. The retiring Chairman had referred to the removal, by death, of E. V. Carey, the greatest of their chairmen and the one who to many of them would always remain the ideal Planters' Chairman. To succeed to the position filled by E. V. Carey and by successors, any of whom it was an honour to follow, must be more gratifying to the ambition of a planter in this country than the attainment of any other public position open to him; and he must thank them, from the bottom of his heart, for having elected him for a second term, and by an unopposed return, to this honourable post.

Assistants on Estates.

Mr. *Macfadyen* would like to take this opportunity of referring to the large numbers of European planters of good reputation now out of employment in the country, and hoped all the members of the Association would exercise what influence they were able to in preventing the introduction into the country of more young planters directly appointed form Hone, while there were perfectly competent men on the spot (applause).

Constituent Associations.

Mr. *Macfadyen* said he wished to add a word about Southern Planters' Association, of which there had been some talk lately. He had been asked to give his opinion on the subject and he therefore wished to state that the policy of the P. A. M. had always been to foster the formation of local associations to represent planting interests, and he was sure if southern associations found they had interests in common which could be better served by their uniting for that specific purpose they would have every assistance and the good wishes from the P. A. M. in doing so, as he took it they might count upon the loyalty of the association concerned. Whether it would serve a useful purpose was for them to decide, though personally he should have thought the case would have been met by meeting when necessity arose. In any case it was a matter for them, and one in which it would be extremely imprudent for the P. A. M. to take sides.

Mr. *Gawler* points out that the Chairman's suggestion of meeting when occasion arose was what had actually been decided upon. He also must mention that it had been the Johore Association, which from the very start had always been against any idea of breaking away from the parent body. They all fully realized that only in union was strength to be found and he was particularly

anxious to dispel misconception, which had apparently arisen in some quarters, that the Johore Association was pursuing particularistic tendencies. Nothing was further from them and he was glad to have this opportunity of making an unqualified statement to this effect.

Mr. *Campbell* describes the meeting of employers at Malacca and concurs with the last speaker, that there was no idea whatever of separating any southern association from the main body of the P. A. M.

ELECTIONS.

The *Secretary* reports that the ballot for the Standing Committee had resulted in the following being elected:—

Messrs. H. R. Quartley, E. B. Skinner, M. Maude, A. J. Fox, A. Dupuis Brown.

The Secretary then announces the Ballot for the Benevolent Fund Committee.

The following are declared elected:—

Messrs. Quartley, Kelley, Fox, J. Argyle Robertson, A. Dupuis Brown, F. G. Harvey, W. D. Bryce, J. McCulloch, J. G. Cruickshank and W. Duncan.

The *Chairman* announces the election of Mr. Zacharias as Secretary with 138 votes out of a total of 142 cast.

BUDGET FOR 1914/5.

The *Secretary* submits the following estimates for the year:—

THE PLANTERS' ASSOCIATION OF MALAYA.

Budget for 1914-5.

To Secretary	$2,400	By Subscriptions	$5,000
,, Legal Expenses	250		
,, Library	175		
,, *Agricultural Bulletin*	750		
,, Printing & Stationery	300		
,, Postages & Incidentals	230		
,, Office Rent	400		
,, Reserve	495		
	$5,000		$5,000

(Sgd.) H. C. E. Zacharias,
Secretary.

The Hon'ble Mr. *E. B. Skinner* considers that the subscription had been very considerably underestimated and he thought they would be more likely to aggregate $5,900. On the expenditure side, he was sorry to see the item "Legal Adviser" being done away with and an item of $250 for legal expenses substituted. He considered it most advisable that the Association should brief a Legal Adviser

of their own, to whom all legal matters could be referred to as a matter of routine. Again, he thought the finances admitted now of their increasing the Secretary's salary. Mr. Zacharias had now been their Secretary for ten years and was still drawing the $200/- he was receiving, when he first took up his duties. If they increased this now to $3,000 per annum, it would still leave them with a reserve of $545 to carry forward.

Mr. *Macfadyen* explains that the subscriptions were always an uncertain item and it was for this reason that the lower figure had been inserted in the estimates.

As regards the Legal Adviser, he thinks they could without one and advocates trying the experiment for a year anyhow.

The question of raising the Secretary's salary was one, of which he felt, sufficient notice had not been given. He quite agreed that it would be difficult to overpay Mr. Zacharias, but under the circumstances considered it would be more in order if this question was deferred until the next meeting.

Mr. *Counsel* having seconded Mr. Skinner's proposal, the motion for substituting "Legal Adviser $500" for "Legal Expenses $250," is put to the meeting and declared lost.

Mr. *Maude* seconds Mr. Skinner's proposal that the Secretary's salary be increased to $3000 p.a.

Mr. *Barbour* proposes and Mr. *Cruickshank* seconds that this question be deferred until the next meeting.

The amendment is put to the vote and declared carried.

Mr. *Burn-Murdoch* then proposes, Mr. *Campbell* seconds, and it is carried unanimously that in the meantime the Estimates, as submitted, be adopted, and that the subscription for the current year be fixed at $100 per delegate, as before.

Honorary Member.

The Hon'ble Mr. *E. Macfadyen* refers to the long and meritorious career in these States of their old legal friend, Mr. G. H. Day, who had always identified himself with the planting interests. He had been their legal adviser for many years and now, that he retired from the East, he thought it only fit that he should be made an Honorary Member of this Association.

Mr. *Munro* seconds the motion with great pleasure and adds how helpful Mr. Day's advice had always been.

The motion is carried unanimously.

General.

The *Chairman* points out that there were still on the Agenda four items, *viz*:

Panama-Pacific Exposition

Repatriation of Unfit Indian Immigrants
Kelantan
Alteration of Rule 17.

If there was no urgency for these, he would suggest that their discussion be held over until their next meeting.

Agreed to.

Mr. *Counsel* says there was one matter, he wished to bring up, *viz.* the very serious damage done by rats in the Bagan Datoh District.

He therefore begged to propose that the P. A. M. approach the Government to urge that adequate and immediate steps be taken to deal with the rat pest in the native holdings in the Bagan Datoh, Rungkup and Melinting districts.

Mr. *Cruickshank* seconds the motion, which is further supported by Mr. *Munro* and carried unanimously.

Mr. *Campbell* reminds the meeting that nothing had yet been done to effect the extension of the F. M. S. Agricultural Dept. to include Malacca particularly and the Colony in general, and instances the serious state of affairs regarding locusts.

The *Chairman* says that the matter is being pressed and that he would personally see to it that the matter was not allowed to drop.

The *Secretary* lays on table a copy of Mr. H. R. G. Leonard's "Colloquial Telegu."

The meeting terminates at 12.30 p.m.

H. C. E. Zacharias,
Secretary.

KANJANG DISTRICT PLANTERS' ASSOCIATION.

Minutes of the Annual General Meeting.

Held at the Kajang Club at 3.30 p.m. 24th April, 1914.

Present Mr. C. Burn Murdoch (Chairman), Messrs. P. F. Wise, R. C. M. Kindersley, E. M. Schwabe, O. P. Dakeyne, K. G. Furley, H. W. Rickeard, A. C. Hayton, C. P. Everard, and H. L. Hixon.

The minutes of the last General Meeting were read and confirmed.

Batavia Congress. The Chairman reported having received a complimentary ticket for the Batavia Congress from the Secretary for the Singapore Committee, which he had been obliged to refuse, as he expected to be on the leave at that time. He had since received a further letter from the Secretary, saying that the Singapore Committee were most anxious that an official delegate of the Association be appointed to attend the Congress.

A letter was then read from Mr. C. G. Jeavons of Balau Estate, suggesting that he be, if possible, appointed delegate, failing the appointment of any other member. Mr. Jeavons mentioned that he proposed in any case attending the Congress.

On the proposition of Mr. E. M. Schwabe, seconded by Mr. R. C. M. Kindersley, it was decided that the matter be left over for the present to see if Mr. W. R. S. Ladell, of the Société Financière des Caoutchoucs would attend as delegate, and that Mr. Jeavons' letter be held over in the meantime.

Report and Accounts. The Chairman next presented the report and statement of accounts for the past year, which were passed without comment.

The report was as follows:—

"During the past year there were three General Meetings, in April, September, and November; these meetings were well attended; there were three Committee Meetings.

It is through the initiative of this Association backed by the P. A. M. that we have now a telephone at Kajang Goods Station, for this we have especially to thank Mr. Macfadyen and Mr. Cummins, who were appointed by the P. A. M. in last season to approach the Government.

Rates of Wages. The rate of wages for Chinese has during the season in review been reduced—since our meeting in September—but there is room for a further reduction. Generally speaking, with one or two noteworthy exceptions, the rates for Tamils remain much about the same—but it is expected that a gradual reduction from inflated rates will come about, that will bring them down nearer to what they were before the boom.

Javanese Rates. The rate of pay for free Javanese has been considerably reduced.

The labour supply in the district is well maintained. This Association decided not to join the Selangor Labour Federation.

Roads. During the year, the main road—within the district—Kajang to Kuala Lumpur has been put into good order. Beyond our boundary, however users of the road have had to endure several miles of road in very bad condition.

Schools. A number of Estates have now established schools for Tamil Children, and the Government's action in allowing afternoon hours for school is thoroughly appreciated.

Health. The health of the district has greatly improved.

F. B. Kendall. This Association deeply regrets the loss it has sustained in the death of Mr. F. B. Kendall and offers its sincerest sympathy to his relatives.

Election of Chairman and Hon. Secretary. On the proposition of Mr. R. C. M. Kindersley, seconded by Mr. O. P. Dakeyne

Mr. C. Burn Murdoch was unanimously re-elected Chairman, as he was willing to act, till he went on leave.

Mr. K. G. Furley was elected Hon. Secretary, proposed by Mr. O. P. Dakeyne and seconded by Mr. E. M. Schwabe.

Election of Committee. The Chairman proposed and Mr. P. F. Wise seconded that last year's Committee be re-elected, Messrs. R. C. M. Kindersley and O. P. Dakeyne taking the places of Messrs. D. Kindersley and E. N. T. Cummins who are absent on leave. The Committee now comprise Mr. C. Burn Murdoch (Chairman) and Messrs. P. F. Wise, E. M. Schwabe, G. D. F. Sinclair, R. C. M. Kindersley and O. P. Dakeyne.

Budget 1914—1915. The Estimates for the current year were discussed. Mr. P. F. Wise proposed that the rate of subscription for the current year be the same as last year, namely $15/-. This was seconded by Mr. H. L. Hixon and carried.

Election of Delegates to the P. A. M. The Chairman, Mr. P. F. Wise and Mr. E. M. Schwabe were elected as delegates.

Telephones. Mr. R. C. M. Kindersley proposed and Mr. K. G. Furley seconded "That the Kajang D. P. A. write to Government on the subject of telephones, complaining of the very bad state of the telephones for some time past and mentioning that up to the present there has been no improvement. That in view of the fact that subscriptions are now being raised, when the old agreements expire, we might reasonably expect a more efficient service."

Labour Rates. Mr. R. C. M. Kindersley mentioned that he understood that the Chinese Rates in Malacca had been reduced to 50 cts.

He therefore proposed and Mr. P. F. Wise seconded that the Hon. Secretary be instructed to write to the Negri Sembilan P. A. to enquire about the present rates ruling for Chinese, Javanese and Tamil Coolies.

Liquor Question. The Chairman spoke on the liquor question, especially in regard to the adulteration of toddy and beer supplied to Tamils.

He referred to the minutes of the Annual General Meeting of the Kuala Lumpur D. P. A., in which the position of affairs was stated, and said that we could not do anything more in the meantime as from those minutes it would appear that Government had the matter in hand.

The Meeting expressed itself in sympathy with other Associations on this question.

After a hearty vote of thanks had been passed to the Chairman for his services during the past year the meeting terminated.

DEPARTMENT NOTES.

Mr. C. B. Holman-Hunt, Assistant Entomologist, Department of Agriculture, F. M. S., arrived at Kuala Lumpur on return from leave and assumed his duties on 8th May, 1914 (Vide A. B. Vol. 1 No. 12 p. 450).

Mr. P. B. Richards, Assistant Agricultural Inspector, Negri Sembilan, has been appointed as 2nd Assistant Entomologist, Department of Agriculture, F. M. S., Kuala Lumpur.

FEDERATED MALAY STATES.

Comparative tatement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1914 and 1913.

Destination.	Exported during March, 1914.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1914.	Duty collected, 1914, to date.
	Tons.	Tons.	Tons.	Tons.	Tons	Tons.	$	$ c.
Straits Settlements ..	1,296 67	2,561.33	3,858 00	2,318.94	1,539.06	...	6,667,874	166,090.53
United Kingdom ...	881.16	1,979 17	2,860.33	2,768.17	92.16	...	5,017,748	125,443.72
Continent of Europe ...	116.04	241.06	357.10	362.82	...	5 72	637,146	15,928.65
Ceylon	74.29	124.55	198.84	175.53	23.31	...	131,595	3,289.87
Other Countries ...	49.53	...	49.53	...	49.53	...	307,535	7,688.24
Total ..	2,417.69	4,906.11	7,323.80	5,625.46	1,704.06	5.72	12,761,898	318,441.01

KUALA LUMPUR,
6th April, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs F.M.S.,

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of March, 1914.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	157.	83.1	91.0	71.5	19.4	77.2	.818	73.2	.72%	...	1.35	1.13
Malacca, Durian Daun Hos.	29.868	157.7	83.4	90.6	71.9	18.7	79.1	.935	...	.84	N.	3.67	1.28
N. Sembilan, Dist. Hospital Seremban	...	151.7	80.4	91.0	70.8	20.2	75.3	.791	72.0	.76	N.W.	6.08	1.67
,, Dist. Hos. K. Pilah	...	156.9	79.2	...	...	...	76.2	.834	73.8	.82	...	4.81	1 40
,, ,, Tampin	...	151.0	82.9	...	...	...	76.0	.775	71.5	.69	...	6.48	1.85
,, ,, P. Dickson	...	166.9	83.3	89.5	75.1	14.4	77.7	.847	74.1	.74	...	5.45	1.69
Pahang, ,, K. Lipis	...	...	82.1	91.0	71.0	20.	75.4	...	...	...	...	3.99	0.91
Penang, ,, Penang	29.815	150.	85.1	92.5	74.1	18.4	77.8	.861	74.3	.71	...	3.24	1.25
Perak, ,, Taiping	...	108.	82.10	95.	70.	25.	77.68	.889	...	.83	...	9.05	1.62
,, ,, Ipoh	...	...	82.95	94.	71.	23.	76.98	.848	...	.77	...	6.56	2.40
,, ,, T. Anson	...	...	82.37	93.	70.	23.	78.35	.915	...	.83	...	6.18	1.50
,, ,, P. Buntar	...	...	83.48	93.	71.	22.	78.99	.929	...	.83	...	1.67	.62
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	5.45	.75
Selangor, General Hospital Kuala Lumpur	...	121.2	80.2	91.	71.2	19.8	77.4	.897	75.6	.85	...	5.31	.86
,, Dist. Hos. Klang	...	...	81.8	88.5	73.7	14.8	76.7	...	...	...	...	7.55	1.75
, ,, K. Selangor	...	...	...	90.1	74.	16.1	...	...	...	...	...	4.57	1.80
, ,, Rawang	...	...	...	91.9	71.7	20.2	...	...	...	...	...	8.77	1.81
Singapore, Kandang Kerbau Observatory	29.915	164.	82.7	92.8	71.	21.8	77.6	.875	...	.79	...	9.33	1.70

THE

AGRICULTURAL BULLETIN

OF THE

FEDERATED MALAY STATES.

No. 11.] JUNE, 1914. [Vol. II.

FURTHER NOTE ON LATEX HYDROMETER

By B. J. Eaton.

This note is published on account of the fact that the writer finds that Messrs. J. J. Griffin and Sons have been sending the wrong type of hydrometer to local firms and planters and not the latest type which are constructed more acurately.

The type of hydrometer issued by Messrs. Griffin and Sons has a stem of only about 4½ inches extending over graduations from 0·9800 to 1·0000, and the smallest divisions represent a density of 0·0005 or nearly 1 per cent of rubber in latex, making it more difficult to read a rubber content of less than 0·5 per cent. In the type described in the article published in April (Vol. II, No. 9), the graduations between 0·9800 and 1·0000 extend over a stem of approximately 7 inches and the smallest divisions represent a density of 0·0002 or about 0·3 per cent of rubber in latex; making the instrument much more accurate. Messrs. Griffin and Sons have been informed of the error, which will be rectified.

In the next issue a table shewing latex densities and rubber content will be given. As there was a slight inaccuracy in the hydrometer used, this has been corrected and controlled accurately with direct determinations made in a special specific gravity bottle and the results are remarkably concordant.

As the graduations do not appear to be properly understood a full table will be given in the next issue and it is intended to issue this table also with each hydrometer,

PRELIMINARY LIST OF INSECTS COLLECTED IN THE FEDERATED MALAY STATES.

By C. B. Holman Hunt.

The following Beetles belonging to the Passalidæ have been identified by Mr. F. H. Gravely of the Indian Museum, Calcutta to whom the Department is much indebted for his kindness.

Passalidæ.

Taeniocerus bicuspis, Kaup.	? ?	Plains.
Ophryogonius inaequalis, (Burm.)	Ulu Gombak, Selangor.	,,
* ,, n. sp.	Maxwell's Hill, Perak.	3400 feet.
Aceraius perakensis, Kniv.	,, ,, ,,	3400 ,,
* ,, grandis, var rectidens (Burm.)	Gap, Selangor-Pahang.	2700 ,,
,, laevicollis, Illig.	Ulu Gombak, Selangor.	Plains.
,, aluteosternus, Kniv.	Bukit Kutu, Selangor.	3300 feet.
* ,, helferi, ? Kniv.	Ulu Gombak, Selangor.	Plains.
,, borneanus, Kaup.	,, ,,	,,
* ,, ,, ? Kaup.	,, ,,	,,
Macrolinus latipennis, (Perch.)	Maxwell's Hill, Perak.	3400 feet.

The Passalidæ are found in rotten wood.

The species marked with asterisk are rare or new. Any one who cares to collect beetles of this family will be doing very useful work, especially if he will send complete families with larvae and pupae in spirits and whole colonies in the case of gregarious species.

The Insects, in this and the subsequent articles of this paper, were captured in the Federated Malay States, and identified by me at the Natural History branch of the British Museum during my furlough. I have to tender my thanks to the members of the Staff there for their kind assistance. Where known, one locality only has been recorded. It does not however follow that the species is confined to this district. Many are widely distributed.

Lucanidæ.

*Odontolabis castlenaui, Parry.	? ?	plains.
,, femoralis, Waterh.	Bukit Kutu, Selangor.	3300 feet.
,, dalmanni, Hope.	Riverside Estate, Selangor.	plains.
,, sp.	Gap, Selangor-Pahang.	2700 feet.
*Metopodontus zebra, Oliv.	Ulu Gombak, Selangor.	plains.
*Cyclommatus luniger, Boil.	Maxwell's Hill, Perak.	3400 feet.
*Hemisodorus rufus, Boil.	Gap, Selangor-Pahang.	2700 feet.
*Dorcus nr. hopei, Saund.	,, ,,	2700 ,,
Dytomoderus mirabilis, Parry.	Ulu Gombak, Selangor.	plains.

Coprides.

Onitis corydon, Boisd.	? ?	plains.
Trox costatus, Wiede,	Batu Caves, Selangor,	,,

MELOLONTHIDES.

Lachnosterna bidentata, Burm.	? ?	plains.
Lepidiota nummicudens, Newm.	? ?	,,
Hoplia bowringi, Waterh.	Maxwell's Hill, Perak.	3400 feet.
,, aurata, Waterh.	,, ,,	3400 feet.
Exopholis hypoleuca, Wiedc.	Bukit Kutu, Selangor.	3300 ,,
*Serica sp.	Maxwell's Hill, Perak,	3400 ,,

RUTELIDES.

Anomala cupripes, ? Hope.	Ulu Gombak, Selangor.	plains.
,, antiqua, Gylh.	? ?	,,
,, nr. citrina, Lansb.	? ?	,,
,, aureola, Hope.	Maxwell's Hill, Perak.	3400 feet.
,, semipurpurea, ? Burm.	Kuala Lumpur, Selangor.	plains.
*Spilota nr. burmesteri, Lansb.	? ?	,,
,, & tigrina, Noutr.		
*Mimela nr. debilis, Sharp.	Maxwell's Hill, Perak.	3400 feet.
,, discoidea, Burm.	,, ,,	3400 ,,
*Parastasia nr. bipunctata, Westw.	Bukit Kutu, Selangor.	3300 ,,
*Adoretus nr. suretus, Chaus.	Kuala Lumpur, Selangor.	plains.
Popilia feae, black var, Kr.	Gap, Selangor-Pahang.	2700 feet.

DYNASTIDES.

Chalcosoma atlas, Linn.	Riverside Estate, K. Selangor.	plains.
Trichogomphus lunicollis, Burm.	? ?	,,
,, simsoni, Vollem.	Gap, Selangor-Pahang.	2700 feet.
Xylotrupes gideoni, Linn.	Teluk Anson, Perak.	plains.
Clyster trachypygus, Bell.	Klang, Selangor.	,,
Oryctes rhinoceros.	,, ,,	,,

CETONIIDES.

Agestrata orichalcea, de Geer.	Riverside Estate, K. Selangor.	plains.
Macronota malabariensis, G. & P.	Kuala Kubu, Selangor.	plains.
,, monacha, G & P.	Batu Tiga, Selangor.	,,
Glycyphana sinuata, Wall.	Kepong, Selangor.	,,
Protaetia acuminata, Fab.	,, ,,	,,
,, fusca, Herbst.	Kuala Lumpur, Selangor.	,,
*Plectrone tristis, green var, Westw.	? ?	,,

CICINDELIDÆ.

Cicindela aurulenta, Fab.	Bukit Kutu, Selangor.	3300 feet.
,, fuliginosa, Dej.	Kuala Lumpur, Selangor.	plains.
,, versicolor, Macl.	? ?	,,
Heptadonta analis, Fab.	Bukit Kutu, Selangor.	3300 feet.
Therates wallacei, Thom.	? ?	plains.

CARABIDÆ.

Anchomenus sp.	? ?	plains.
*Orthogonius hopei, Grey.	? ?	,,
,, sp.	? ?	,,
*Casnonia sp.	Parit Buntar, Perak.	,,
Mormolyce phyllodes, Hagen.	Batang Benar, ,,	,,

(*To be continued.*)

RUBBER YIELDS FROM THICK AND THIN BARKED RUBBER TREES.

By F. G. Spring.

It is well known that some trees of either the thick or the thin barked type may be prolific yielders or the reverse, consequently it is difficult, on a small scale, to obtain reliable figures in a test comparing the yields of thick and thin barked rubber trees. The results of an experiment, in this connection, conducted at Kuala Lumpur Government Plantation, may however be of some interest, and although no definite deduction can be drawn it would perhaps tend to show that there is no appreciable difference, if any, between the yields of rubber obtained from thin and thick barked trees as such.

	Thick Barked Trees	Thin Barked Trees
No. of trees	25	25
Average bark thickness per tree	.87 c. m.	.71 c. m.
Yield for eleven months, Latex Rubber	37 lbs. 12½ ozs.	35 lbs. 14 ozs.
do. do. do. Scrap do.	11 lbs. 10½ ozs.	11 lbs. 2½ ozs.
Total Latex Rubber & Scrap	49 lbs. 7 ozs.	47 lbs. ½ oz.

A similar system of tapping was conducted in both plots, the trees were not tapped previous to the commencement of this experiment. The bark thickness was taken in a relative position in each tree. The age of the rubber is about five years old.

Reference to the tables will show that the thick barked trees yield 49 lbs. 7ozs. rubber while the thin barked trees yield 47 lbs. ½ oz., this difference is well within the limits of experimental error.

SUMMARY OF LOCUST WORK MARCH 12 TO APRIL 30, 1914. SELANGOR.

By F. W. South.

The destruction work at Kalong was finished on March 13th: the final remnants of the swarms being destroyed, so that practically no locusts were left north of Kuala Lumpur. On March 12th one Special Assistant was transferred to Kajang and took charge of the destruction work in that neighbourhood. The other remained

in the district between Kuala Lumpur on the north and Cheras and Serdang on the South, the work being principally at Serdang and Sungei Besi. On March 31st destruction work ceased as all the hoppers that had not been destroyed had then escaped as fliers. During the period from March 12-31 in the Kajang district the largest number of gangs at work in one day was 14 and the largest catch recorded in one day was 868 kerosene tins full. The results may be summarised as follows.

Kalong March 12 and 13	..	80 tins.
Kajang March 12-31 ..	..	6404 tins.
Serdang March 21-28 ..	..	332 tins.
S. Besi March 16-31 ..	..	1315 tins.
Total	..	8131 tins.

The total catch for the hopper season February 13 to March 31st was:—

U. Yam Bahru, S. Choh and Kalong Feb. 13 to Mch. 13	2150 tins.
Petaling, S. Besi and Serdang Feb. 23 to March 31 ..	2891 tins.
Kajang district to Cheras and Serdang Mch. 12-31 ..	6404 tins.
Total ..	11,445 tins.

During the early part of April scouting work for flying swarms occupied the attention of the staff and it was found that about 8 flying swarms occurred around Kuala Lumpur and 13 around Kajang. The majority of these were quite small. Some of the Kajang swarms appeared to have come up recently from the south.

On April the 18th a big swarm of fliers appeared at the 5th mile on the Ulu Klang Road and a breeding ground was found at the 8th mile on the same road on April 21st: on April 22nd a big swarm of fliers appeared on the Rifle Range. On April 27th to 30th hoppers were found at the 4½ and 8th miles on the Ulu Klang Road. These breeding grounds and hoppers are difficult to account for as they could not represent the offspring of flying locusts that escaped from the previous generation of hoppers in February and March, for the reason that the time that had elapsed between the escape of the fliers and the appearance of these hoppers was too short to allow the former to come to complete maturity and produce eggs. It is possible that these big mature flying swarms were connected with two big swarms that disappeared in the jungle at the end of January one between Klang Gates and Ulu Pudu and the other near Dusun Tua. At the end of the month preparations were being made to deal with these hoppers belonging to what must be regarded as an intermediate generation.

The Negri Sembilan.

The destruction work in this State during the last fortnight of March may be summarised as follows.

Seremban District, Ulu Kanchong March 16-28 ..	20 tins.
Coast. Linggi, Sua Betong and Ayer Kuning March 15-28	137 tins.
Tampin. Tampin Town, Keru, 30th Mile Tampin Road March 28-31	50 tins.
Total ..	207 tins.

In the Seremban District hoppers extending over approximately 16 acres were successfully poisoned. In the Coast District large swarms of hoppers were expected in the localities mentioned above as large flying swarms apparently from Malacca had laid there. Fliers were record in the Kuala Pilah district at Bahau, Kuala Jelei and Kuala Pilah town.

During the first fortnight of April the catches recorded were:—

Seremban District, Ulu Kanchong and Linggi March 30 to April 12	62 tins.
Coast District, Ayer Kuning and Silian	114 tins.
Tampin District, Keru and Tampin town April 1-15	532 tins.
Total ..	708 tins.

In the Seremban District 12 acres of hoppers were successfully poisoned. One swarm of fliers was found on the Negri Sembilan boundary, no others were north of Seremban. Poisoning in the Coast district was not undertaken on account of the difficulty of procuring molasses.

During the last fortnight of April the catches were:—

Seremban District, Linggi Plantations April 13-25 ..	556 tins.
Coast District, Ayer Kuning, Sua Betong and Jemima Estate April 13-25	785 tins.
Tampin District, Tampin town, Keru, Keru Road and Gemencheh April 16-30	639 tins.
Total ..	1424 tins.

In the Seremban district about 7 acres of hoppers were successfully poisoned. Fliers appeared on the Labu Road and on the Setul pass. In the Tampin district the situation was very bad and the whole country from Tampin to Gemencheh was full of locusts both in the Negri Sembilan and Malacca. Parts of this district are very difficult of access and one gang of coolies had to be kept in tents at Pondoy. The Kuala Pilah district was free

from hoppers. The results in the Negri Sembilan during the period may be summarised as follows.

Seremban Dist., March 16 to April 26	638 tins 35 acres poisoned.
Coast District, March 16 to April 26	480 tins
Tampin Dist., March 16 to April 30	1221 tins
Total ..	2339 tins, 35 acres poisoned.

The situation in the south of the State was very bad at the end of April as all the country on the boundary of Malacca from Tampin eastward was full of hoppers. The Swarms continue to be small on an average as compared with those in Selangor, the usual size of a swarm being from 4 to 10 kerosene tins full with a few catches amounting to 70 tins. Though small the swarms are often very numerous and are frequently scattered over a comparatively limited area. The constant removal of apparatus necessitated by this naturally increase the time required for catching, while it has been found, in addition, that a large swarm can be dealt with almost as fast as a small one, provided the ground is not difficult.

An interesting feature of the work in the Seremban district has been the success of the method of spraying poisons on the grass on which the locusts are feeding. This has resulted in the destruction of from 60-100 per cent of a swarm according to the conditions under which the work has been done. The handicap to the general adoption of this method has been the difficulty of obtaining molasses; a coarse cheap sugar at 8 to 10 cents per kati has been used as a substitute, but is not so satisfactory. There is no doubt that for small swarms scattered over large areas of lalang the spraying method is far the quickest and most successful. Attempts are being made to obtain a satisfactory supply of molasses. When this is done, the spraying method will be widely adopted in all cases where hoppers have to be destroyed in large stretches of open lalang land, except where the use of poisons is dangerous.

DYNAMITE EXPERIMENT.

By F. G. Spring.

It may be remembered that in October of last year a demonstration, on the use of explosives as applied in rubber cultivation, was given at the Experimental Plantation Kuala Lumpur by Mr. MacQueen, representing Noble's Explosives Company, Ltd., of Glasgow. The results in this article are those obtained from an area which Mr. MacQueen subjected to gelignite charges.

The land on which the experiment was carried out is of a poor laterite nature, and the rubber very backward in growth, four year old trees measuring about 12 inches in girth, three feet from the ground.

Three rows of rubber, running the length of the field, and each containing 34 trees were selected, one row being the dynamite plot while the other two acted as controls. The cartridges were placed at a depth of about $2\frac{1}{2}$ feet below the surface of the ground, one cartridge between two trees $12\frac{1}{2}$ feet apart. (Distance of planting $12\frac{1}{2}$ ft. by 25 ft.) The method of firing was by means of fuses and detonators.

It is unfortunate that this particular soil is not one which would be expected to give the best results, subsoils of a clay nature should respond better to the use of explosives. An experiment on a very much larger scale is being conducted at Castleton Estate, Teluk Anson, where the soil is of a heavier type. Below is a record of the figures in respect of the experiment conducted at Kuala Lumpur.

Date of application of dynamite 24th October, 1913.

	Dynamite Plot	Control No 1	Control No. 2
Average girth measured 3ft from ground on 30th October, 1913.	9·75 ins.	9·5 ins	10·25 ins.
Average girth measured 3ft. from ground on 9th June, 1914.	12·31 ins.	11·31 ins.	11·87 ins.
Average girth increase from 30th Oct., 1913, to 9th June 1914.	2·56 ins.	1·81 ins.	1·62 ins.

It will be seen that in the dynamite plot the average girth increase, over a period of seven months and a few days, amounts to 2·56 ins. while in control No. 1, the increase is 1·81 ins. and in No. 2, 1·62 ins. It might here be stated that control No. 1 is adjacent to the dnyamite plot while No. 2 is some distance away.

I would not care to say definitely that the excess in girth increase over the control plots is due to the effect of dynamite, but as the area in which the experiment was conducted shows more or less uniform growth throughout, and bearing in mind that one of the controls had the largest average girth at the commencement it would appear that the explosive had good effect even on this soil, whether it is profitable will depend on how long the beneficial effects last. It is intended to remeasure the trees in a few months time.

With regard to the cost of application, 15 cents per charge, inclusive of labour, would perhaps be a reasonable figure, one charge per tree is generally what is allowed.

NOTE ON THE CAMPHOR MARKET.

By B. J. Eaton.

Recent literature on Camphor production appears to indicate that any rise in price of the natural product will be met by the output of larger quantities of the synthetic product. The price of Japanese monopoly camphor, for some time, has been about 135 *s.* (shillings) per cwt. c.i.f. for "B." and 142/6 (shillings) for "B.B." grade and opinions are expressed that prices are not likely to advance. At the same time, for small samples of crude offered from outside sources, 175 *s.* per cwt. has been asked for Japanese "B.B." flowers and for China crude 157/6 c.i.f. The manufacturers of synthetic are said to be meeting with fair success and in the U. S. A. it is stated that the makers have been able to reach the present basis of cost of the refined product, while in Germany it is said that synthetic camphor has been brought on the market at a cost of production of 80 *s.* per cwt. The continued success of the synthetic product depends however on the cost of the raw material, turpentine, which shows a tendency to rise, unless some other raw material can be found as a starting point. On account of the Japanese monopoly, it is said to be more profitable to obtain the refined material from Japan than to purchase crude and refine it in Europe. The demand for fine camphor recently has increased and the price has risen consequently to 1/8 per lb. with prospect of a further advance. It is considered unlikely however that the high prices ruling in 1907 will be reached again, as the policy of the Japanese Government must be to eliminate the synthetic product.

Experiments in planting camphor trees appear to have been started on a large scale in several of the Japanese islands, and to have been successful, and the monopoly authorities state that sufficient trees are being planted to compensate for those cut down. The revenue derived from the camphor monopoly however does not appear to be very great; in fact it is described as a financial failure, which may be due to the competition of the synthetic product.

Experiments in Japan on a large scale are also being carried out by distilling the leaves, as has been done in this country and in German East Africa, Ceylon and California. The leaves are easy to transport and a central distilling station has been suggested.

Experiments on a large scale at Amani, German East Africa, in the distillation of leaves, have been discontinued owing to the lack of means of acquiring a suitable modern still and of defraying cost of distilling.

This seems strange in view of the Government financial support which is usually given in Germany for scientific work.

A World's Camphor Trust is stated, in Schimmel's Semi-Annual Report (April 1914), to be contemplated.

MINUTES OF MEETING OF THE PLANTERS' ASSOCIATION OF MALAYA,

Held at the Chamber of Commerce, Kuala Lumpur, on June 28th, 1914, at 10.45 a.m.

PRESENT:

Chairman: The Hon: Mr. E. Macfadyen
Secretary: Mr. H. C. E. Zacharias.

Delegates:—

Bagan Datoh D. P. A.: Messrs. R. H. W. Davidson, R. G. Bayley, E. Enfield Lawford.
Batang Padang D. P. A.: Messrs. F. J. Ayris, T. H. Stewart.
Batu Tiga D. P. A.: Mr. T. C. Cumming.
Johore P. A.: Mr. R. J. C. Jewitt.
Kajang D. P. A.: Messrs. C. Burn-Murdoch, P. F. Wise, R. C. M. Kindersley.
Kapar D. P. A.: Mr. L. Mooijaart.
Klang D. P. A.: Messrs. E. W. Harvey, E. B. Prior, E. C. Wakefield.
Kuala Langat D. P. A.: Messrs. R. W. Munro, J. H. Cotterill,
Kuala Lumpur D. P. A.: The Hon: Mr. E. B. Skinner, Messrs. A. J. Fox, F. Clyde-Jeavons, H. Armstrong.
Kuala Selangor D. P. A.: Messrs. Thos. H. Menzies, C. W. Bradburne, L. A. Irving, E. D. Money.
Malacca P. A.: Mr. J. W. Campbell.
Negri Sembilan P. A.: Messrs. J. Bruce, S. S. Crisp, V. A. Tayler, A. Dupuis Brown, A. Davidson, J. D. McCulloch, P. W. N. Farquharson.
Taiping D. P. A.: Messrs. H. de Z. Lancaster, A. Waterfield.
Ulu Selangor D. P. A.: Mr. M. P. Kennaway.

Honorary Members:—

Messrs. L. Lewton-Brain, (Director of Agriculture) and E. S. Hose, (Ag: Controller of Labour).

Visitors:—Messrs. C. G. Newton (Madura Co. Ltd.), H. R. Quartley, W. G. Dobson, W. H. Trotter, C. J. Arnold, F. G. Harvey, H. C. D'Arcy-Irvine, M. Sharpe-Smith, J. M. Booth, and J. G. Cruickshank,

1. The minutes of the Meeting held on April 26th are considered seriatim, confirmed and signed.

2. LONDON (1914) EXHIBITION.

The *Secretary* reports having to date received $8636.51 and that further promises for about $1700 were still outstanding. $2000 had so far been advanced to the Director of Agriculture on account of the £1000 guaranteed by the Association.

He further reports that Mr. H. M. Darby had cabled on the 19th inst. "Regret unwell, appoint another delegate" and that, as instructed by the Chairman, he had replied suggesting Mr. C. E. S. Baxendale as a substitute. Approved.

3. MADURA CO., LTD.

The Secretary reads a letter from the Secretary of the Central Perak D. P. A. on the subject of recruiting charges in which Mr. W. Kellie Smith moved that this Association ask the P. A. M. to take up the question of Binny & Co's and the Madura Co's charges, with a view to having a fixed inclusive charge, such figure not to exceed one rupee per coolie shipped, and to eliminate all commissions.

It was pointed out that last year's arrivals numbered 118, 583, and that such an enormous increase warrants a reduction of charges. and it was hoped that the P. A. M. will be able to take this matter up.

It was proposed by the Hon. *Mr. Skinner* and seconded by Mr. Dupuis Brown that this letter be forwarded to the Indian Immigration Committee with a request to go into the matter.

Mr. Newton of the Madura Co. suggested that before any decision was arrived at a deputation of planters should go to India and acquaint themselves with the nature and amount of work done by his company, adding that the company would be pleased to pay all expenses in connection with such a visit.

Mr. Tayler points out that immigration had probably reached high water mark last year and that with decreasing numbers, the remuneration of the Madura Co. would also tend to become less.

Mr. Macfadyen welcomes Mr. Newton's generous offer, saying that they would all admit they were under immense obligations to their agents in India in the past, and that these latter had every right to expect that the Association would not precipitately commit themselves to an expression of opinion that the charges were excessive.

He would suggest that the Secretary consult with Mr. Newton and endeavour to arrange for a small deputation to go over to India

and on their return submit a report on the matter to the Standing Committee, who would then take up the question with the Indian Immigration Committee, or not, as they deemed advisable.

On the proposal of *Mr. Prior*, seconded by *Mr. Bruce*, the Chairman's suggestion is adopted.

4. Assistants' Register.

A letter from the Batang Padang D. P. A. was read, suggesting the establishment of a register under the auspices of the P. A. M. for unemployed planters.

As a rough idea of organisation the formation of a sub-committee on the following lines was suggested in the letter:—

Chairman:—To be elected from members of the sub-committee

Secretary:—Secretary of the P. A. M.

Members (11) consisting of the chairman of a District Association from each State thus:—(1) Perak, (2) Selangor, (3) Negri Sembilan, (4) Province Wellesley, (5) Malacca, (6) Johore, (7) Singapore, (8) Pahang, (9) Kedah, (10) A Visiting Agent who has given up practical planting, (11) a representative of a well known firm of agents.

A registration fee according to the following scale to be deposited by applicants:—

(*a*) Managership—$20, (*b*) Superintendent in charge—$15, (*c*) First Assistantship—$10, (*d*) Second assistantship—$5; employers to pay a similar sum on being suited and a further similar sum after 3 months; employers can also register vacancies. Full enquiries, which should be confidential, to be made in each case, by the Committee. The number of applicants and vacancies on the register to be published monthly in the *Agricultural Bulletin*.

Mr. Macfadyen denied the statement attributed to him that there were over 200 planters out of employment, and stated that in his opinion, the number had been much exaggerated and that there was a demand in excess of the supply for junior appointments.

Although welcoming the idea of a register, he considered it would be entirely outside the province of the P. A. M. to assume responsibility for the qualifications of applicants.

Mr. Mooijaart considers that the case would be scarcely met by the Secretary forwarding a list of names on the register to employers, without any expression of opinion as to the suitability of the candidate and suggests that the D. P. A's accept the onus of the recommendations.

It was proposed by *Mr. Campbell* seconded by *Mr. Ayris* and carried that the matter be referred to the Standing Committee for action, if necessary.

5. Secretary.

The question of the Secretary's salary postponed from the last meeting was brought up.

It was proposed by *Mr. Skinner* and seconded by *Mr. Macfadyen* that the Secretary's salary for the current financial year be $3,000. The motion is carried unanimously.

Mr. Cruickshank was informed that this did not create a precedent, as the Secretary's salary is presented and voted on annually as one of the items of the budget.

6. Truck Enactment.

Correspondence between the Under Secretary F. M. S. and the Secretary P. A. M. on the subject of amendments to the Truck Enactment was read.

Mr. Skinner said that he and Mr. Macfadyen had been appointed a sub-committee to draft a reply to the Government report on the subject. He regretted the delay and submitted their report herewith.

"Report of the Sub-Committee Appointed to Consider the Question of Amending the Sections Dealing with the Truck System in the Labour Code of 1913."

"The report of the Committee appointed to inquire into the truck system, which is contained in paper No. 13 of 1913, has been carefully considered.

"1. *Compulsory feeding of New Arrivals.* In section 7 of the Committee's report it is recommended that a section should be inserted requiring every employer to supply every immigrant in his employ, who has arrived in the country for the first time within the preceding four months, with cooked rations according to a prescribed scale, and deduct the actual cost of such rations up to a fixed maximum, from the employee's wages.

"Whilst admitting that the feeding of new coolies on estates where the health is not good has had a most salutary effect, we submit that the system would, if insisted on in all cases without exception, constitute a very real grievance.

"We agree with the remarks made in the Secretary's letter of the 16th of July 1913 to the Under Secretary, and consider that compulsory feeding of Indian Immigrants on all estates is quite unnecessary.

"2. *Sanction of the Chief Secretary.* We understand that the Government do not desire that the requisitions for compulsory feeding should be made with the knowledge and sanction of the Chief Secretary.

"We feel that to leave unrestricted powers in the hands of the Controller might lead to hardship, so we would suggest that where an employer so elects, the power of the Controller to order compulsory feeding of coolies shall only be insisted on after consultation with the Advisory Rural Boards.

"3. *Estate Shops.* On page 5 of the Committee's report, in section 10, it is suggested that the sale of rice might be allowed at a tariff approved by the Controller, even in cases where the estate is not two miles distant from a town or village. Whilst appreciating this concession, we do not consider that in practice, a shop would be opened for the sale of rice only, as the shop-keeper would not consider the inducement sufficient. We can see no reason at all why any estate should not be permitted to have a shop situated on its own land, as the shop could then be under the supervision of the Manager and the standard of food and rice could be efficiently controlled.

"We strongly recommend that the enactment be altered so that any estate may have a shop of its own.

"4. *Supply of Rice.* The Labour Code should be amended to allow of all estates where rice is supplied direct by the employer to deduct the cost of rice from the wages of the labourer in the Check Roll. This system has been in force for many years, and, in principle, has received the sanction of the Government, but it has never been legalised, and we consider it most important that it should be. Provision can be made in the Enactment that rice can only be supplied and deducted from the wages with the permission of the Controller of Labour, and at a rate to be fixed by him.

"5. *Committee's Report on the Truck System.* Subject to the amendments proposed as above, we consider that the recommendation made by the Committee should be carried out as soon as possible."

Sgd. E. Macfadyen.
„ E. B. Skinner.

Mr. Prior proposes, *Mr. McCulloch* seconds and it is carried unanimously that the Sub-Committee's Report, as read, be adopted and submitted to the Government.

7. Panama-Pacific Exposition.

Mr. Macfadyen stated that it had been defined decided that the F. M. S. Government would not be represented; on the grounds

that the Home Government was not exhibiting officially and that it was not a special trade exhibition. He pointed out that it was quite hopeless for the P. A. M. to undertake an exhibit on its own account. This was agreed to.

8. Rat Pest in Bagan Datoh District.

Correspondence from the Chairman of the P. A. M. to the Chief Secretary F. M. S. and the Secretary P. A. M. to the Under Secretary F. M. S. on the subject of the rat pest and drainage in the Bagan Datoh district was read.

Mr. Macfadyen suggested the following recommendations in his letter:—

1. that an Agricultural Inspector be stationed in the neighbourhood until the rat plague has been got under control.
2. that such officer be given legal powers enabling him to deal with the plague whether on European-owned or native holdings.
3. that from the beginning he be provided with sufficient funds.
4. that every effort be made to arrange for the manufacture locally of Liverpool Virus.
5. that the control of outlet-drains and water-gates be placed under a drainage board containing representatives of the estates interested.
6. that the sums of money actually spent by various estates on drains now taken over by Government be refunded to the estates in full.

Mr. Cruickshank, at the request of the chairman, then addressed the meeting on the subject, stating that the matter had been brought up at the previous meeting by Mr. Counsel, then Chairman of the Bagan Datoh D. P. A. He informed the meeting that the Chief Secretary had received them sympathetically and assured them that an officer of the Agricultural Department would be sent to the district as soon as possible with sufficient power to deal with the rats on European estates and on the native holdings from which it was suggested the rats emanated, and that a sum of \$5,000 should be provided for the campaign.

The planters of the district promised their co-operation. As far as he knew no such officer had yet been sent. The question of a supply of Liverpool virus was also mentioned and he understood enquiries were being made from the local medical authorities and in the event of them not being able to supply the virus, enquiries to be made from India.

He stated that this year 35,000 rats including about 65 per cent female had been destroyed by means of traps and a pack of hunting dogs.

As to the question of drainage, at a recent meeting the Acting Resident of Perak was of opinion that the Government officers were doing all that was necessary. The planters in the district thought otherwise and asked the P. A. M. to back them up, in asking for a board similar to that in the Kapar district. A grievance was also raised, in connection with the Government proposal to pay the estates for the drains already cut; it was pointed out that payment was made on measurements carried out two years after the drains were cut, by which time they had silted up considerably and the refund was consequently less than the cost.

Mr. Lawford thanked Mr. Cruickshank for his remarks and proposed the following resolution:—

With reference to the points discussed at an interview granted by the Chief Secretary to a Sub-Committee of the Standing Committee of this Association on 13th inst. this Association desires to press upon Government the urgency of the various matters referred to in the Chairman's letter of that date addressed to the Chief Secretary, and also the particular importance of improving transport, postal and telegraph facilities in Bagan Datoh District in the immediate future.

Mr. Munro supported the remarks regarding the urgency of the situation and seconds the proposal, which was carried unanimously.

9. Repatriation of Unfit Indian Immigrants.

Correspondence between the Ag. Controller of Labour and the B. I. Steam Navigation Co., on the subject of repatriation of unfit coolies, which had been forwarded to the Secretary P. A. M. was read. The B. I. S. N. Co. offered to give free passages to India to all coolies who through no fault of their own, landed unfit for labour or became unfit within one month and passage at a reduced rate of $6.25 for adults and $3.25 for minors (including shipping and landing charges) to all other coolies who became unfit within six months of joining an estate; such coolies to be shipped under the charge of the Controller of Labour and to be taken charge of by the Emigration officers at Negapatam or Madras on arrival in India and forwarded to their homes at the expense of the estate; certificates for such passage to be signed by the Manager of the estate, and Government doctor. The Ag. Controller of Labour in his reply stated that the Indian Immigration Committee, while appreciating the generosity of the offer, were of opinion that the

scheme was open to grave abuse and might create a tendency to relax the care which should be exercised in selecting coolies for employment.

A letter sent by a member to the Central Perak D. P. A. was read on the subject of the lack of provision of medical examination of Kangany recruited coolies at Negapatam, Kangany licences and recruiting commissions.

It was pointed out that any estate requiring such coolies to be medically examined had to pay a fee of R1-00 per coolie.

It was also proposed at the same meeting of the above D. P. A. that Associations affiliated to the P. A. M. be asked to combine to agitate for a medical examination of coolies in India before shipment, the expenses of such examination to be borne by the Indian Immigration Department.

On *Mr. Skinner's* suggestion, *Mr. Hose* was asked to express his opinion and stated that a cursory examination took place at Negapatam, coolies' hands being examined to see if they were used to agricultural labour and coolies in poor condition were rejected. He considers that employers would soon regret it, if they insisted on a more stringent examination. It was not possible always to tell the effect of a voyage and in some cases latent diseases were possibly overlooked. Any estate requiring extra medical examination of coolies could obtain it. No action was taken.

10. Kelantan.

A letter from the chairman of the Kelantan P. A. to the Secretary P. A. M. was read, the contents of which are briefly as follows:—

Labour:—All the labour till the middle of 1913 was practically all indentured Chinese, and it was admitted generally that the coolies were admirably treated. The new amendment of the Labour Code of Kelantan which was based on that of the F. M. S. was considered to give too arbitrary powers to the only Medical authority in the State.

Custom Duties:—The high custom duties were mentioned and the high cost of living in Kelantan, it being considered that the present duties on many of the necessities of life are unduly hard on rubber companies who are the main employers of labour and the main source of the country's revenue.

State Council Representative:—A petition that there should be an unofficial representative on the State Council had been refused.

Facilities in Kelantan:—The want of a European hospital and the inadequate police force and absence of an inspector in the

planting district were pointed out, also the lack of roads for vehicular traffic in the district, river transport being precarious, as the Kelantan River is only navigable at certain periods for shallow draft vessels.

Federation:—On account of these grievances the planters of Kelantan are therefore desirous that the State should be brought within the Federation and are about to petition the Sultan accordingly.

11. Rules.

The following proposals were received by the Secretary for the alteration of Rule 17:—

(*a*) By Negri Sembilan P. A.:—

"The Association shall at every Annual Meeting elect ten of its members as a Standing Committee with power for such Standing Committee to add to its number."

(*b*) By Kuala Langat D. P. A.:—

"The Standing Committee shall consist of the Chairman of each Constituent Association in conjunction with any other member or members elected at the Annual General Meeting."

A letter on the same subject from Kampong Batu, N. S. to the Chairman P. A. M. was also read: the suggestions made in the letter were as follows:—

(*a*) That each State, or District in the case of a State having Sub-divisions with Local Committees of control, be allotted according to its rights of representation, a fixed number of members on the Standing or General Committee of the Association.

(*b*) That the Chairman of the various sub-committees be, ex officio, members of the General Committee; and that the other representative or representatives of each State or District be elected by the Local Committees from amongst their own membership.

Mr. Tayler withdrew the Negri Sembilan proposals in favour of the Kuala Langat one. He considered that 24 members (19 chairmen and 5 others) were not too many for a committee representing such large interests.

Mr. Munro seconded the Kuala Langat D. P. A.'s proposals and mentioned that there was, at present, not a single planter from any of the Coast Districts of Selangor on the Standing Committee. He feels the fear that 24 would be an unwieldy number to the groundless, as it was certain that all members would not attend.

Mr. Skinner reminded the meeting of the former custom of appointing planters from all over the country to the Standing Committee, which had been abandoned owing to the difficulty of getting men together. The Committee was purely advisory and had no inherent power to act independently.

Mr. Dupuis Brown supported Mr. Skinner and as the originator of the Committee stated that his original idea of a Committee was opposed strongly on the grounds that such a committee would encroach on the dignity and usefulness of the P. A. M.; he considered the new proposal would tend more strongly to do this.

Mr. Campbell thought that every Chairman of a district should have an opportunity of attending the Committee when any subject closely affecting his district was brought up and *Mr. Irving* thought it would add usefulness to the local Chairman.

Mr. Macfadyen opposed the idea strongly, stating that the Committee was entirely an Emergency Committee. There had recently been a tendency for the Committee to arrogate to itself the duties of the P. A. M. and this had been noticed and stopped. He thought this tendency would increase still more with a large and representative Committee. He considered the P. A. M. the only true representative Committee and would like to see them revert to the two-monthly instead of quarterly meetings.

The motion for the alteration to Rule 17 was then put to the meeting and lost.

12. Indian Immigration.

Mr. Wakefield and *Mr. Ayris* draw attention to the corrupt practices of watchmen at Indian Stations, who refuse to allow coolie to entrain unless bribed.

Mr. Hose (Ag: Controller of Labour) said he thought such practices did occur and they received the attention of the Indian Immigration Committee who would do their best to deal with actual cases brought to their notice.

Mr. Newton (Madura Co.) said his company would take action if the Kanganies reported such cases.

Mr. Macfadyen stated that progress was being made in connection with the establishment of direct communication with Cocanada.

13. Reduction of Wages.

A letter from the Kajang D. P. A. to the Secretary P. A. M. was read, stating that this Association now wished to work down to the pay of Tamils, stated in the resolution passed by it on November 7th and asking what help the P. A. M. could give.

Mr. Burn-Murdoch withdraws the matter.

14. Absconding.

A letter from the Kuala Selangor D. P. A. to the Secretary P. A. M. on the subject of absconding was read, suggesting that the following subject be discussed at the meeting. "The inadequacy of facilities for procuring and signing warrants for the arrest of bolted coolies."

Mr. Irving considers the matter of great urgency and gives instances of hardship under which estates at a distance from head quarters suffered.

Mr. Skinner proposed and *Mr. Prior* seconded that the subject be referred to the Standing Committee.

15. Rail Freights.

A letter from the Secretary Kuala Selangor D. P. A. to the Secretary P. A. M. was read, asking that the subject of Reduction on Rail freights be discussed.

Mr. Irving asks for this matter to stand over till the next meeting.

16. Dressers on Estates.

A letter from the Secretary Batang Padang D. P. A. to the Secretary P. A. M. was read, in which was suggested the urgent necessity of a Government register of Dressers qualified to take charge of estate hospitals, such dressers to receive a certificate of competence.

Mr. Stewart showed the necessity of registration and proposed that the matter be placed before the P. M. O. This was seconded by *Mr. Farquharson* and carried.

17. Currency.

Mr. McCulloch drew attention to the disappearance of quarter and half cent pieces from the currency and thought that if these were issued, the coolies, who were inclined to think in the least coin would tend to reduce his present large ideas. He did not propose any resolution.

The meeting terminated at 1 p.m.

(Sgd.) H. C. E. Zacharias,
Secretary.

DEPARTMENT NOTES.

Mr. P. B. Richards, 2nd Assistant Entomologist, Department of Agriculture, F. M. S. assumed his duties on 23rd June, 1914 (Vide A. B. Vol. II No. 10 p. 288).

Mr. D. H. Grist, has been appointed as Agricultural Instructor, Department of Agriculture, F. M. S.

Mr. S. W. Bunker, Assistant Government Analyst, Singapore, has been appointed as 2nd Assistant Chemist, Department of Agriculture, F. M. S. He arrived and assumed his duties on 7th July, 1914.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1914 and 1913.

Destination.	Exported during April, 1914.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1914.	Duty collected, 1914, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	$	$ c.
Straits Settlements ...	1,131.76	3,858.00	4,989.76	3,053.63	1,936.13	...	8,771,424	217,922.61
United Kingdom ...	817.69	2,860.33	3,678.02	3,529.17	148.85	...	6,568,448	164,211.20
Continent of Europe ...	85.92	357.10	443.02	452.51	...	9.49	803,518	20,087.95
Ceylon	65.34	198.84	264.18	216.40	47.78	...	255,279	6,381.92
Other Countries ...	50.74	49.53	100.27	...	100.27	...	413,498	10,362.45
Total ...	2,151.45	7,323.80	9,475.25	7,251.71	2,233.03	9.49	16,812,167	418,966.13

KUALA LUMPUR,
5th May, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs, F.M.S.

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of April, 1914.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	Temperature. Mean Dry Bulb.	Temperature. Maximum.	Temperature. Minimum.	Temperature. Range.	Hygrometer. Mean Wet Bulb.	Hygrometer. Vapour Tension.	Hygrometer. Dew Point.	Hygrometer. Humidity.	Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
Kelantan, Kota Bahru	...	151.	84.	92.73	74.56	18.16	79.3	.903	76.2	.77%	...	1.72	.72
Malacca, Durian Daun Hos.	29.887	154.8	81.	88.8	71.8	17.	79.3	.961	...	.86	N.	12.	2.56
N. Sembilan, Dist. Hospital Seremban	...	151.4	79.4	90.4	71.8	18.6	76.	.824	73.5	.82	N.W.	13.95	2.22
,, Dist. Hos. K. Pilah	...	154.7	79.5	...	...	...	76.3	.849	74.1	.84	...	10.22	1.75
,, ,, Tampin	...	149.3	81.	...	...	...	77.	.851	74.3	.80	...	5.33	1.75
,, ,, P. Dickson	...	160.1	82.4	89.	74.8	14.2	78.1	.880	75.3	.79	...	8.91	1.00
Pahang, ,, K. Lipis	...	...	82.	91.6	72.7	18.9	76.2	...	...	...	...	5.81	2.00
Penang, ,, Penang	29.820	148.9	83 9	90.7	74.1	16.6	78.5	.907	73.5	.78	...	7.37	2.55
Perak, ,, Taiping	...	109.	81.44	93.	70.	23.	77.59	.894	...	.85	...	21.97	3.25
,, ,, Ipoh	...	...	81.63	92.	71.	21.	77.09	.868	...	.81	...	8.00	1.63
,, ,, T. Anson	...	...	82.11	93.	68.	25.	78.48	.924	...	.85	...	14.85	2.16
,, ,, P. Buntar	...	...	82.29	92.	72.	20.	78.26	.912	...	.83	...	7.25	1.82
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	12.32	1.97
Selangor, General Hospital Kuala Lumpur	...	119.1	80.	89.7	70.7	19.	77.1	.875	75.1	.85	S.E.	11.30	2.70
,, Dist. Hos. Klang	...	...	80.8	86.4	75.4	11.	77.8	...	...	...	...	10.43	2.23
,, ,, K. Selangor	...	...	...	87.7	73.7	14.	...	...	...	...	...	6.36	2.78
,, ,, Rawang	...	...	...	91.3	72.9	18.4	...	...	...	...	...	13.51	2.10
Singapore, Kandang Kerbau Observatory	29.915	160.	82.7	92.5	72.4	20.1	78.7	.929	...	82.1	S.E.	13.32	5.32

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TABLES AND INSTRUCTIONS FOR USE WITH LATEX HYDROMETER.

BY B. J. EATON.

Although, in some cases, hydrometers are made with direct readings of the substance to be estimated on the stem, it was thought more desirable in the construction of a hydrometer for the estimation of the rubber content of Hevea latex, to have the instrument graduated in density figures on the stem and to issue a table with each instrument.

Several scientific apparatus makers issue special hydrometers graduated at 84° F for use in the tropics, since it is often impossible, even in a laboratory in the tropics, to reduce the temperature of the liquid to be tested to 60° F (= 15° C) the temperature at which most densities are calculated in temperate climates, in comparison with distilled water which is taken as 1·0000 at that temperature; with instruments which are graduated at 84° F, the density of the liquid is compared with water, which is taken as 1·0000 at 84° F, which is found to be approximately the average shade temperature in the factory or laboratory in this country.

Each hydrometer should therefore float, if correct, with the lowest mark, which represents pure water (density = 1·0000) coinciding with the surface of the water. Theoretically, distilled water should be used, but most waters in this country contain such a small quantity of dissolved solids, that the instrument can be tested in ordinary water, as the error thus introduced is so small. The small bulb at the bottom of each instrument is screwed to the instrument and contains a small cavity which can be loaded. The

bulb is usually loaded with shots; if the instrument is too heavy, *i.e.* the lowest division (1·0000) sinks below the surface of the water being tested, shot must be removed, whereas, if the instrument is too light, small shots or small particles of lead may be added. It is preferable however to ask for scientific advice if the instrument is incorrect.

Instructions for Reading Instruments.

The instrument of the latest type is graduated from 0·9800 to 1·0000 which represents a rubber content of latex varying from about 33 per cent to zero, the figure 0·9800 representing latex containing 33 per cent of dry rubber and the figure 1·0000 representing pure water. The total density range for 33 per cent of rubber is therefore only 0·02.

The instrument has been tested against estimations made in a special specific gravity bottle with a stopper having a capillary tube and cover, which enables very accurate measurements to be made. The writer's instrument was found to give results agreeing exceedingly well with the determinations made with the bottle.

Only a few actual figures are marked on the stem of the instrument thus, 980, 5, 990, 5, 1·00. These figures respectively mean 0·9800, 0·9850, 0·9900, 0·9950 and 1·0000. Each of the larger divisions corresponds to 0·001 and each of the smaller divisions to 0·0002 or one-fifth of the larger divisions. All the graduations on the stem are given in the following table, which it is hoped will be sufficiently explanatory. As will be seen from the table, three of the smallest divisions represent 0·0006 which corresponds to a difference of 1 per cent in the rubber content, *i.e.* each small division representing 0·0002 corresponds to 0·33 per cent of rubber.

Table I. gives the density figures and the corresponding rubber content in direct percentage or grammes per 100 cubic centimetres and also in pounds of dry rubber per gallon of latex.

Table. II. is published to enable any planter to dilute his latex to three definite fixed standards. *i.e.* a latex giving 2 lbs., 1½lbs., or 1¼ lbs. of dry rubber per gallon. With the present methods of coagulation etc., it would be advisable if all estates worked to the same standard dilution of latex, as in this way a step towards the standardisation of First Quality sheet would be made. Thus, assuming that the density of the latex as brought to the factory from the field is 0·9850, (a latex of this density, as per Table I contains 25 per cent or 2·5 lbs. of dry rubber per gallon) and it is required to add water, so that each gallon of latex shall contain 1½ lbs. of dry rubber per gallon, it is necessary

to add 5·3 pints or 5 pints 6 ozs. of water to each gallon of the latex or 53 pints (= 6 gallons 5 pints) to every 10 gallons of the latex. I do not wish it to be assumed that I am in favour generally of the dilution of latex; in the preparation of sheet of good appearance, free from air bubbles, "coagulation" marks etc., some dilution is necessary and a latex giving 1½ lbs. of dry rubber per gallon is not excessively diluted (the effect on the quality of the rubber of this dilution, which amounts usually to about equal volumes of pure latex and water, will be tested shortly). Although a third column has been added in which latex is diluted to give 1¼ lbs. of dry rubber per gallon (a dilution practised on some estates), dilution to this extent is not recommended, as it is unnecessary in the preparation of First Quality Sheet.

Table III. is given, on account of the fact that this method of working is adopted on some estates; that is, in order to make a sheet of standard size and weight, each lot of latex is tested by various methods and such a quantity taken in each coagulating pan as will give a sheet of the desired weight. (*N.B.* This method cannot be carried to the extent of the dilution given in the table.) A factor, is introduced in such a process, which is undesirable, *viz.* that of variable concentration, which, even though it may not be very large, probably influences the quality of the rubber. This method is therefore not recommended, especially since the method recommended under Table II, although it introduces dilution of the latex, allows the latex to be reduced always to a standard density from which the coagulated rubber must be constant in quality, if the same method of coagulation is maintained throughout, and the same period of smoking or other treatment to which the rubber may be subjected, as far as possible.

As I have pointed out in previous notes on this instrument (Vide A. B. Vol. II Nos. 9 & 11) it is not advisable to use the hydrometer direct for a density much below 0·9850, even though it is graduated to 0·9800, since latex containing approximately 25 per cent of rubber or more is somewhat viscous, and accurate readings cannot be made. In such cases, equal quantities of latex and water are mixed carefully and the density read off, the rubber content corresponding to this being doubled to give the true percentage in the original latex. Thus, assuming the latex brought to the factory has a density of 0·9838 which corresponds to 27 per cent or 2·7 lbs. per gallon of dry rubber, this figure may be more than 1 per cent in error due to the viscosity of the latex; on diluting the latex with an equal part of water the density became say 0·9920 which from Table I corresponds to 1 lb. 5·3 ozs. of rubber, per gallon of latex; the rubber content of the original latex is there-

fore 2 lbs. 10·6 ozs. or 2·66 lbs. per gallon (= 26·6 per cent) ; this figure is therefore the more accurate; dilution with an equal part of water is merely recommended as being the simplest procedure. Only sufficient latex need be taken so that after dilution with an equal volume of water, there is sufficient in which to float the instrument. If a cylindrical glass vessel of about 3 inches diameter and 10 inches deep is used, as small a quantity as 18 ozs. of latex may be used. The amount of latex actually taken for the test does not affect the result, as long as sufficient is present in which to float the instrument. In order to obtain the total rubber yield per plot or per acre etc. the volume of the latex, as well as the density, must, of course, be known.

The instrument is of use in several ways *e.g.* if tapping experiments are being conducted, instead of weighing up all the rubber from each experiment and keeping the latex separate, the density and the volume of the latex can be taken, and the latex then bulked. Similarly if the yields on certain divisions or plots on an estate are required, similar measurements may be made and the latex subsequently bulked. At present on many estates the latex from different fields is coagulated separately in order to ascertain variations in yields; this separation usually means a variation in the quality of the rubber from such divisions or fields. The daily crop of First Quality rubber can also be ascertained immediately after the latex is received in the factory. The instrument should be washed carefully in water immediately after use, and dried with a soft cloth. The writer will be pleased to give personal advice or further information if application be made to the Director of Agriculture when any difficulty arises.

TABLE I.

Density of latex.	Dry rubber per cent or grammes per 100 ccs.	Dry rubber per gallon.		
9820	30·0	3·0 lbs. =	3 lbs.	0 ozs.
9822	29·6		2 „	15·5 „
9824	29·3		2 „	14·9 „
9826	29·0	2·9 „	2 „	14·4 „
9828	28·6		2 „	13·9 „
9830	28·3		2 „	13·3 „
9832	28·0	2·8 „	2 „	12·8 „
9834	27·6		2 „	12·3 „
9836	27·3		2 „	11·7 „
9838	27·0	2·7 „	2 „	11·2 „
9840	26·6		2 „	10·6 „

9842	26·3			2	,,	10·1	,,
9844	26·0	2·6	,,	2	,,	9·6	,,
9846	25·6			2	,,	9·0	,,
9848	25·3			2	,,	8·5	,,
9850	25·0	2·5	,,	2	,,	8·0	,,
9852	24·6			2	,,	7·4	,,
9854	24·3			2	,,	6·9	,,
9856	24·0	2·4	,,	2	,,	6·4	,,
9858	23·6			2	,,	5·8	,,
9860	23·3			2	,,	5·3	,,
9862	23·0	2·3	,,	2	,,	4·8	,,
9864	22·6			2	,,	4·2	,,
9866	22·3			2	,,	3·7	,,
9868	22·0	2·2	,,	2	,,	3·2	,,
9870	21·6			2	,,	2·6	,,
9872	21·3			2	,,	2·1	,,
9874	21·0	2·1	,,	2	,,	1·6	,,
9876	20·6			2	,,	1·0	,,
9878	20·3			2	,,	0·5	,,
9880	20·0	2·0	,,	2	,,	0	,,
9882	19·6			1	,,	15·4	,,
9884	19·3			1	,,	14·9	,,
9886	19·0	1·9	,,	1	,,	14·4	,,
9888	18·6			1	,,	13·9	,,
9890	18·3			1	,,	13·3	,,
9892	18·0	1·8	,,	1	,,	12·8	,,
9894	17·6			1	,,	12·2	,,
9896	17·3			1	,,	11·7	,,
9898	17·0	1·7	,,	1	,,	11·2	,,
9900	16·6			1	,,	10·6	,,
9902	16·3			1	,,	10·1	,,
9904	16·0	1·6	,,	1	,,	9·6	,,
9906	15·6			1	,,	9·0	,,
9908	15·3			1	,,	8·5	,,
9910	15·0	1·5	,,	1	,,	8·0	,,
9912	14·6			1	,,	7·4	,,
9914				1	,,	7·0	,,
9916	14·0	1·4	,,	1	,,	6·4	,,
9918				1	,,	5·8	,,
9920				1	,,	5·3	,,
9922	13·0	1·3	,,	1	,,	4·8	,,
9924				1	,,	4·2	,,
9926				1	,,	3·7	,,
9928	12·0	1·2	,,	1	,,	3·2	,,

9930			1 „	2·6 „
9932			1 „	2·1 „
9934	11·0	1·1 lbs. =	1 lbs.	1·6 ozs.
9936			1 „	1·0 „
9938			1 „	0·5 „
9940	10·0	1·0 „	1 „	0 „
9942				15·4 „
9944				14·9 „
9946	9·0	0·9 „		14·4 „
9948				13·8 „
9950				13·3 „
9952	8·0	0·8 „		12·8 „
9954				12·2 „
9956				11·7 „
9958	7·0	0·7 „		11·2 „
9960				10·6 „
9962				10·1 „
9964	6·0	0·6 „		9·6 „
9966				9·0 „
9968				8·5 „
9970	5·0	0·5 „		8·0 „
9972				7·4 „
9974				6·9 „
9976	4·0	0·4 „		6·4 „
9978				5·8 „
9980				5·3 „
9982	3·0	0·3 „		4·8 „
9984				4·2 „
9986				3·7 „
9988	2·0	0·2 „		3·2 „
9990				2·6 „
9992				2·1 „
9994	1·0	0·1 „		1·6 „
9996				1·0 „
9998				0·5 „
1·0000	0·0	0·0 „		0 „

TABLE II.

Density of Latex	Volume of water required per gallon of latex to producea latex yielding :—					
	(a) 2 lbs per gallon		(b) 1½ lbs. per gallon		(c) 1¼ lbs per gallon	
	pints.	pints. ozs.	pints.	pints. ozs.	pints.	pints. ozs.
9820	4· 0 =	4— 0	8 =	8— 0	11· 2 =	11— 4
9822	3·84	3—17	7· 8	7—16	11· 0	11— 0
9824	3· 7	3—14	7· 6	7—12	10· 7	10—14

9826	3· 6	3—12	7· 5	7— 9	10·55	10—11
9828	3·44	3— 9	7· 2	7— 5	10· 3	10— 6
9830	3· 3	3— 6	7· 1	7— 1	10· 1	10— 2
9832	3· 2	3— 4	6· 9	6—18	9· 9	9—18
9834	3· 0	3— 1	6· 7	6—14	9· 7	9—14
9836	2· 9	2—18	6· 5	6—11	9· 5	9—10
9838	2· 8	2—16	6· 4	6— 8	9· 3	9— 6
9840	2·64	2—13	6· 2	6— 4	9· 0	9— 0
9842	2· 5	2—10	6· 0	6— 0	8· 8	8—16
9844	2· 4	2— 8	5· 8	5—16	8· 6	8—12
9846	2·24	2— 5	5· 6	5—12	8· 4	8— 8
9848	2· 1	2— 2	5·45	5— 9	8· 2	8— 4
9850	2· 0	2— 0	5· 3	5— 6	8· 0	8— 0
9852	1·84	1—17	5· 1	5— 2	7· 8	7—16
9854	1· 7	1—14	4· 9	4—18	7· 6	7—14
9856	1· 6	1—12	4·75	4—15	7· 4	7— 8
9858	1·44	1— 9	4· 6	4—12	7· 2	7— 4
9860	1· 3	1— 6	4· 4	4— 8	7· 0	7— 0
9862	1· 2	1— 4	4·25	4— 5	6· 7	6—14
9864	1·04	1— 1	4· 1	4— 2	6· 5	6—10
9866	0· 9	18	3· 9	3—18	6· 3	6— 6
9868	0· 8	16	3· 7	3—14	6· 1	6— 2
9870	0·64	13	3· 5	3—10	5· 9	5—18
9872	0· 5	10	3·35	3— 7	5· 7	5—14
9872	0· 5	10	3·35	3— 7	5· 7	5—14
9874	0· 4	8	3· 2	3— 4	5· 4	5— 8
9876	0·24	5	3· 0	3— 0	5· 2	5— 4
9878	0· 1	2	2· 8	2—16	5· 0	5— 0
9880	0· 0	0	2· 6	2—12	4· 8	4—16
9882			2·15	2— 9	4·55	4—11
9884			2· 3	2— 6	4· 3	4— 6
9886			2· 1	2— 2	4· 1	4— 2
9888			1· 9	1—18	3· 9	3—18
9890			1· 7	1—14	3· 7	3—14
9892			1·55	1—11	3· 5	3—10
9894			1· 4	1— 8	3· 2	3— 4
9896			1· 2	1— 4	3· 0	3— 0
9898			1·05	1— 1	2· 8	2—16
9900			0· 9	18	2· 6	2—12
9902			0· 7	14	2· 4	2— 8
9904			0· 5	10	2· 2	2— 4
9906			0· 3	6	2· 0	2— 0
9908			0·15	3	1· 8	1—16
9910			0· 0	0	1· 6	1—12

9912	1· 4	1— 8
9914	1· 2	1— 4
9916	1· 0	1 — 0
9918	0· 8	0—15
9920	0· 6	0—12
9922	0· 3	0— 6
9924	0·05	0— 1
9926	0· 0	0— 0

TABLE III.

Density of Latex.	Volume of latex required to yield					
	(a). 2 lbs of dry rubber		(b) $1\frac{1}{2}$ lbs of dry rubber		(c) $1\frac{1}{4}$ lbs of dry rubber	
	pints	pints ozs.	pints	pints ozs.	pints	pints ozs.
9820	5·33 =	5— 7	4· 0 =	4— 0	3·33 =	3— 6
9822	5·40	5— 8	4·04	4—08	3·37	3— 7
9824	5·46	5— 9	4·09	4—18	3· 4	3— 8
9826	5· 5	5—10	4·15	4— 3	3·45	3— 9
9828	5·65	5—11	4·18	4—36	3· 5	3—10
9830	5· 6	5—12	4·25	4— 5	3·53	3—10·6
9832	5·70	5—14	4· 3	4— 6	3·57	3—11
9834	5·75	5—15	4·34	4— 7	3·62	3—12
9836	5·85	5—17	4· 4	4— 8	3·66	3—13
9838	5· 9	5—18	4·44	4— 9	3· 7	3—14
9840	6· 0	6— 0	4· 5	4—10	3·76	3—15
9842	6·05	6— 1	4·55	4—11	3· 8	3—16
9844	6·15	6— 3	4· 6	4—12	3·84	3—17
9846	6·25	6— 5	4· 7	4—14	3· 9	3—18
9848	6·35	6— 7	4·75	4—15	3·95	3—19
9850	6· 4	6— 8	4· 8	4—16	4· 0	4— 0
9852	6· 5	6—10	4·85	4—17	4·06	4— 1
9854	6· 6	6—12	4· 9	4—18	4· 1	4— 2
9856	6·66	6—13	5· 0	5— 0	4·17	4— 3
9858	6·75	6—15	5·07	5—14	4·23	4— 5
9860	6·85	6—17	5·14	5—28	4· 3	4— 6
9862	6·95	6—19	5· 2	5— 4	4·34	4— 7
9864	7·05	7— 1	5· 3	5— 6	4· 4	4— 8
9866	7·15	7— 3	5·38	5—76	4·45	4— 9
9868	7·26	7— 5	5·48	5— 9	4· 5	4—10
9870	7· 4	7— 8	5·54	5—10·8	4· 6	4—12
9872	7· 5	7—10	5· 6	5—12·0	4·69	4—14
9874	7· 6	7—12	5· 7	5—14	4·76	4—15
9876	7· 7	7—14	5· 8	5—16	4·85	4—17

9878	7·85	7—17	5· 9	5—18	4· 9	4—19
9880	8· 0	8— 0	6· 0	6— 0	5· 0	5— 0
9882	8·15	8— 3	6· 1	6— 2	5· 1	5— 2
9884	8· 3	8— 6	6· 2	6— 4	5· 2	5— 4
9886	8·45	8— 9	6· 3	6— 6	5·26	5— 5
9888	8· 6	8—12	6· 4	6— 8	5· 4	5— 8
9890	8·75	8—15	6·54	6—10·8	5·46	5— 9
9892	8· 9	8—18	6·66	6—13	5·55	5—11
9894	9·05	9— 1	6· 8	6—16	5· 7	5—14
9896	9·25	9— 5	7· 0	7— 0	5· 8	5—16
9898	9· 4	9— 8	7·06	7— 1	5· 9	5—18
9900	9· 6	9—12	7· 2	7— 4	6· 0	6— 0
9902	9· 8	9—16	7·35	7— 7	6· 1	6— 2
9904	10· 0	10— 0	7· 5	7—10	6· 2	6— 4
9906	10· 2	10— 4	7·65	7—13	6· 4	6— 8
9908	10·45	10— 9	7· 8	7—16	6· 5	6—10
9910	10· 7	10—14	8· 0	8— 0	6·66	6—13
9912	10· 9	10—18	8· 2	8— 4	6· 8	6—16
9914	11·15	11— 3	8· 4	8— 8	7· 0	7— 0
9916	11· 4	11— 8	8·57	8—11	7· 1	7— 2
9918	11· 7	11—14	8· 8	8—16	7·34	7— 7
9920	12· 0	12— 0	9· 0	9— 0	7· 5	7—10
9922	12· 3	12— 6	9· 2	9— 4	7· 7	7—14
9924	12· 7	12—14	9· 5	9—10	8· 0	8— 0
9926	13· 0	13— 0	9· 7	9—14	8· 1	8— 2
9928	13· 3	13— 6	10· 0	10— 0	8· 3	8— 6
9930	13· 8	13—16	10·34	10— 7	8· 6	8—12
9932	14· 1	14— 2	10· 6	10—12	8· 8	8—16
9934	14· 5	14—10	10· 9	10—18	9· 1	9— 2
9936	15· 1	15— 2	11· 3	11— 6	9· 4	9— 8
9938	15· 5	15—10	11·64	11—13	9· 7	9—14
9940	16· 0	16— 0	12· 0	12— 0	10· 0	10— 0

Note:—In the above tables, the maximum rubber content included is 30 per cent corresponding to a density of 0·9820, although the maximum reading obtainable on the instrument is 33·33 per cent corresponding to the lowest density figure on the scale *viz*. 0·9800.

As there are only a few figures engraved on the stem, which may not be understood properly, it may be necessary to explain their significance.

The lowest figure given is 980 which means 0·9800. The smallest divisions correspond to 0·0002, so that the divisions read as in the tables above 0·9800, 0·9802, 0·9804, 0·9806, 0·9808, 0·9810, etc., etc,

REPORT ON LOCUST WORK MAY 1st TO JULY 5th.

BY F. W. SOUTH.

SELANGOR.

In the report published in the June number of the *Agricultural Bulletin* it was stated that the eggs and very young hoppers of an intermediate generation began to appear around Kuala Lumpur at the end of April. These were the offspring of two big flying swarms which appeared unexpectedly during the month of April. The origin of these swarms was stated to be uncertain, but it was suggested that they were connected with two big swarms that were lost sight of near Klang Gates and Dusun Tua earlier in the year. There is, however, a reasonable possibility that they came up from the Negri Sembilan and the fact that their breeding season exactly corresponds with that of the majority of the Negri Sembilan swarms lends some support to this theory.

The period from May 4th to June 30th was fully occupied with the destruction of the hoppers of this intermediate generation and this was only just concluded at the end of June. The district in which the insects appeared was a long belt of country running from Klang Gates through Ampang, and the Rifle Range, to the Circular Road near the Race Course, the Race Course itself and the Forest Reserve near it as far as Ulu Pudu. Other swarms were found on Bungsar Estate, in the Public Gardens, near the Agricultural Department and over the hills as far as Batu Road.

There were several points of interest about this generation. It was found in certain localities, notably on the Race Course, that when a group of swarms had been nearly destroyed a new group would hatch out without the laying of any additional eggs. This seems to point to some delay in the hatching of the eggs. These delayed swarms were found to appear in some instances three weeks and in others as much as six weeks after the earlier swarms in the same localities had first been observed. It is practically certain that all the eggs were layed at the same time, as coolies were working continuously in all the localities and yet no flying locusts were observed to be laying there after those that layed the first batches of eggs.

Another point of interest was the successful employment of poison in dealing with some of the swarms. This was the first occasion on which poison had been used successfully in Selangor.

The results obtained may be summarised as follows,

May 4-May 15	2,037 tins	68 swarms
May 16-May 31	6,367 tins	154 swarms
June 1-June 15	11,209 tins	257 swarms
June 15-June 30	9,291 tins	307 swarms
	28,904 tins	786 swarms

The maximum number of gangs employed on any one day was 13, but throughout the period from 9 to 13 gangs were employed every day. About 6,000 kerosene tins full of locusts were destroyed on the Race Course alone.

Only one swarm escaped from this generation and that entered the jungle near Klang Gates and could not be dealt with in any way. Of the flying swarms that escaped from the previous regular generation of February and March hoppers there are two small swarms one at Rawang and one at Serendah with a somewhat larger one near Ulu Yam. Three others are known in the Sungei Besi, Pudu neighbourhood, while round Kajang the number varies as the swarms cross and recross the Negri Sembilan boundary. In all there are about 14 swarms mostly small which may be expected to lay eggs about the end of July. There should not be much difficulty in destroying practically all the offspring of these swarms. It is, however, always uncertain when the situation may be complicated by the appearance of large swarms from the Negri Sembilan.

NEGRI SEMBILAN.

In the Negri Sembilan the work of locust destruction was continuous in all three districts from the end of April to the end of May when it ceased in the Tampin district. In this last there was a well marked hopper season extending from April 1st to June 6th. In the other two districts work was continuous until the end of June, ceasing in the Seremban district on June 27th but continuing in the Coast to July 5th when the number of swarms of hoppers was very small. In the Seremban district the hopper season was continuous from March 30th to June 27th and it would appear that two generations have overlapped in this district. In the Coast the generations have become so intermixed that hoppers are practically always present though they are far more numerous at certain times than at others.

The results obtained may be summarised as follows.

SEREMBAN DISTRICT.

	Driving. Tins	Driving. Swarms	Poisoning. Swarms
April 27-May 10	390½	79	19
May 11-May 23	897½	167	26
May 25-June 6	1,236	175	53
June 6-June 20	392	72	20
June 20-June 27			7
	2,616	493	125

COAST DISTRICT.

	Tins	Swarms	Swarms
April 27-May 9	403	113	
May 11-May 23	679	85	2
May 25-June 6	1,035	85	19
June 6-June 20	520	63	33
June 22-July 5	114	26	8
	2,751	372	62

TAMPIN DISTRICT.

	Tins	Swarms
May 1-15	2,748	145
May 15-30	3,360	159
June 1- 6	190½	14
	6,298½	318

This gives a total of about 11,665 tins of locusts destroyed by driving, respecting 1,183 swarms, while 187 swarms were poisoned.

In spite of this work the situation in the South of the Negri Sembilan is very disappointing as large swarms of fliers were reported to be present in June throughout the Tampin district and at the end of the month there were extensive areas containing eggs at Ayer Muria-land, Bukit Seriah and Ayer Kuning. Further breeding grounds are expected at Si Rusa, on the 17th-20th miles of the Port Dickson railway and near St. Leonards Estate. Ten swarms are known in the Seremban district, two being well on their way into the Jelebu district. It seems fairly certain that the large swarms bred inside the Malacca boundary near Tampin have all found their way into the Negri Sembilan or Johore, as Malacca was generally reputed to be fairly free from locusts in June, while large flying swarms appeared all over the Negri Sembilan, especially in the south east; at the same time other swarms were reported

to have crossed the Johore boundary. It is very probable that an immense amount of work will have to be done when hoppers next appear in the Negri Sembilan, but it would also appear that if they can be successfully dealt with, the number of locusts in the peninsula generally should be materially reduced, as on the whole the locusts appear to be concentrated at present (July 23) in the Negri Sembilan.

THE JERUSALEM ARTICHOKE IN MALAYA.

BY J. LAMBOURNE.

The Jerusalem Artichoke (*Helianthus tuberosus*) has been grown, by a few, in the Malay Peninsula for some years past, but it has never become as widely cultivated as it deserves. It is difficult to understand why this should be as the cultivation of this plant is of the easiest. Little cultivation is required beyond deep changkolling of the land before planting, and keeping down weeds until the plants are large enough to shade the ground.

The tubers are used as a vegetable. They are also used as a salad, either raw or cooked. They are popular with many Europeans, and as good vegetables are scarce this plant ought to be more widely grown than it is at present. The plants will grow in almost any situation but the best results are obtained when they receive liberal treatment in the matter of soil, and plenty of room to develop. The soil should be deeply cultivated and a dressing of well rotted cattle manure should be worked into the land a few weeks before planting.

The tubers should be planted in rows two feet apart. The best time for planting is just as the young shoots are appearing on the tubers. They may be planted before this with fairly good results but there is better chance of an even plant if the tubers have all commenced to grow before they are planted. They should be lightly shaded until the young shoots are well above the ground as they grow away more rapidly than if exposed to the full rays of the sun. The stems do not grow as tall as they do in more temperate climates but they usually flower freely which is the exception in England. When the plants are fully grown (about 4 feet in height) the leaves begin to wither and die. It is then that the tubers are ready for the table.

When Artichokes are grown for human consumption and where the demand is small it is not advisable to plant up a large area at one time, as the tubers soon become discoloured and uneatable if

lifted and stored, and if left long in the ground they commence to sprout again. To keep a succession of tubers it is necessary to plant up a small plot about once a month, thus a constant supply of young tubers may be obtained. Three to four months are usually required from the time of planting until the crop is available.

The tubers of the Artichoke grown in this country are much more branched than those grown in more temperate climates. This is probably due to climatic conditions being suitable for constant growth. In this country there is no decided change in season, so that the tubers do not undergo a resting period as is the case in countries where a decided change occurs.

In spite of the plant being smaller in growth, and the tubers more branched than in temperate climates, the yield is comparatively good. From a small plot grown on the Experimental Plantation Kuala Lumpur in fairly good soil an average of more than 3 lbs. per plant was obtained. The tubers were planted 2′ x 2′, the yield would therefore be about 13½ tons per acre. This yield is perhaps more than could be expected over a large area with poorer soil. However, judging from yields obtained in a smaller garden in "Carcosa" grounds, on comparatively poor soil, as much as 10 tons per acre could probably be expected from any ordinary well cultivated soil. That this yield is fairly good will be seen by a comparison with others from different parts of the world. In New South Wales 7-10 tons per acre* and in Poona† an average of 5 lbs. per square yard were obtained. This latter is approximately equal to 10¾ tons per acre. In America—the home of the Jeruslam Artichoke—considerably higher yields have been obtained by deep cultivation and manuring. Yields from 20-30 tons per acre are stated to have been obtained on Experimental Stations in the U. S. A. It is stated in the Experiment Station Record U. S. A. 1910 page 531 that as much as 38.9 tons of White Jerusalem Artichoke were obtained from sandy soil.

In addition to its use as a vegetable for human consumption the Artichoke is grown in some parts of the world as a field crop and the tubers are fed to Poultry, Cattle, Sheep and Swine.

Mr. T. Greiner** Vegetable Specialist La Salle N. Y. says that:—"All kinds of Farm animals are fond of the tubers. They may be ground and fed, mixed with ground grain, to Poultry with good results. As a succulent food for cattle, sheep, swine, and

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* W. H. Potts. "Pigs and their Management."

† Gardening in the Tropics by S. M. Woodrow P. 335.

* Cyclopedia of American Horticulture.

perhaps other form of stock this tuber seems to deserve more general attention."

Mr. W. H. Potts, Principal of Hawksbury College Experiment Farm Richmond N. S. W., in a work on "Pigs and their management" says that:—"Few foods are more relished by pigs. The tuber in the raw state is very nutritious more especially for pregnant sows and also sows reduced in weight and condition after sucking a litter. For feeding pigs it is best to turn them into the crop to root out the tubers. It must be remembered however that where it is desired to continue the crop the pigs should be removed before all the tubers are eaten.

"The outcome of a number of tests goes to show that for fattening purposes these tubers must be given with grain and have a similar result to feeding with potatoes. The average composition of the Artichoke is shown here in contrast with the potato:—

	Water	Ash	Protein	Carbo hydrate	Fat	Nutritious value
Artichoke	79·5	1·0	2·4	16·7	0·2	1: 7
Potato	78·9	1·0	2·1	17·9	0·1	1: 8·6"

In conclusion I might mention that anyone wishing to take up the cultivation of this Artichoke on a small scale may obtain tubers from the Department of Agriculture, Kuala Lumpur. A very limited supply of tubers will in a short time be available for distribution.

MALAYAN RUBBER AND COCONUT SOILS.

BY M. BARROWCLIFF.

Paper submitted to the London Congress of Tropical Agriculture.

For the past 18 months the writer has been engaged solely in the examination of the soils supporting rubber, coconuts and rice in the Federated Malay States. Estates have been visited in nearly every district in the country and an endeavour made to obtain an insight into the relationship between the soil's productiveness and its mechanical and chemical composition.

The subject is one of great importance to agricultural interests: the land has no previous cultivation history, and has for the most part been claimed from the original jungle only within the last few years. The selections made during the "boom" may be likened to a lottery which is only now beginning to reveal its prizes—and its blanks; for in many instances it is apparent that the yields likely to be obtained will fall far short of the anticipated.

The difference between the best rubber land and the average indifferent may be put as at least 100%, in the case of coconuts at 300% or more; from which figures some idea may be gathered of what significance to the investor the choice of the land is.

There is however no doubt that many of the less suitable soils, both rubber and coconut, are open to vast improvement under proper treatment; but it is essential that this should be started whilst the plantation is young, so that an early recognition of the necessity is essential.

In the present paper is given an account of the conclusions the writer has reached on the points mentioned above, and a few observations on the selection of land. Finality is not claimed, as new points of view are continually presenting themselves; but it is hoped that these notes will serve for comparison with those forthcoming from other tropical countries in which perhaps knowledge of the subject is in a state more advanced.

It has not been possible as yet to undertake any bacteriological work, but it is hoped to do so later, as the solution of many problems of interest may be expected from this mode of attack.

To prevent confusion it will be convenient to keep separate the remarks on the composition of the rubber and coconut soils respectively; but as regards the methods of improvement that may be employed these are of a general nature and apply equally to both; they therefore will be dealt with at the end.

Rubber Soils.*

Mechanical composition:—The soils on which rubber is planted in the Federated Malay States may be divided into three classes; those composing the undulating land, rising up to 500 feet, that broadens down from the central range of granitic mountains; the flat low-lying land forming the plains and valleys and formed alluvially from the mountains; and the flat peaty coast soils, probably fairly recently laid down by the sea, and, at the time of reclamation, consisting of tidal mangrove swamp.

Of these the first and the last have produced the highest yielding estates; the first because owing to the light sandy nature and perfect natural drainage, deep and extensive rooting has been possible; the last when artificially well drained only and when sufficient organic matter is present to have the same effect as sand in rendering the soil light and porous. Where both these conditions are not fulfilled the land is far from being satisfactory and is in some cases proving a source of great anxiety to the planter.

* The methods of analysis adopted are those recommended by Hall and Russell.

The second class mentioned, the inland alluvial soil, is less suitable, not on account of any deficiency in plant food material, but because of its close and impermeable texture. It contains little organic matter, and large proportions of the silts and clay. Consequently even when adequately drained, root growth is restricted and is mainly confined to the surface. Such soils crack badly in dry weather and the trees suffer severely.

These observations must be regarded as being general only; hill soils of a clayey type are to be met with, as, on the other hand, are lowlying soils sandy in texture. In the following table are given the mechanical analyses of representative samples of the sandier soils, all being excellent yielders.

	1	2	3	4	5
Coarse sand	..	..	..	..	..
Fine sand	61·4	56·0	60·1	53·0	40·8
Silt	9·2	12·1	8·1	9·3	6·0
Fine silt	9·4	4·2	8·8	13·6	16·1
Clay	17·7	25·9	19·5	22·0	24·6
Humus	2·3	1·8	3·5	2·1	2·5

No. 1 is of the Government experimental plantation at Kuala Lumpur, where trees 12-14 years old, numbering now about 90 to the acre, are yielding at the rate of about 9 lbs. per tree per annum. The remainder are all from well known estates.

No. 2, on which are 11 year old trees, gives 600 lbs. per acre; Nos. 3 and 4, both 9-10 year trees, 500 lbs. approximately; and No. 5, where the age is eight only, 450 lbs.

It is seen that the proportion of sand to fine silt and clay ranges from 2: 1 and over in the first three to 1: 1 in the case of No. 5.

The sandiest soil under rubber the writer has had occasion as yet to examine contained no more than 71% of sand to 11·4% of clay and 6·9% of fine silt. The yield was poor but the chemical composition was poor too, and it would not be safe to regard this degree of sandiness as being one necessarily to be associated with diminished returns. No statement regarding the limit can therefore as yet be made.

The texture of typical alluvial clay soils, class No. 2, is shewn by the following figures. On land of this type eight year old trees are usually found to yield not more than about 250 pounds per acre, or 2 lbs. per tree.

	6	7	8	9	10
Coarse sand	..	..	..	..	..
Fine sand	19·3	13·3	2·4	21·2	3·5
Silt	10·4	28·7	13·5	44·5	19·9

Fine silt	21·7	21·5	31·0	16·8	33·8
Clay	16·6	34·5	50·4	16·0	38·8
Humus	2·0	2·0	2·7	1·5	4·0

No. 9 is an instance in which the closeness of texture is due to the large preponderance of silt; the growth here being exceptionally poor. In the other cases the predominance of the clay and fine silt fractions is such as in Europe would probably be associated with extreme infertility.

Stones and gravel are very rarely found in Malayan soils, in fact in most cases no material coarser than 0·5 mm. is met with.

Chemical Composition:—It seems characteristic of tropical soils that the analytical results afforded by even the most fertile of them are much poorer than those of temperate climates.

This is particularly noticeable when comparing the "available" amounts, of potash and phosphate; but no doubt the higher temperature and greater rainfall causes more rapid decomposition of the complex soil constituents, and also perhaps produces conditions more favourable for bacterial growth, so that the plant has always a sufficiency to draw upon.

Nitrogen:—The percentages of nitrogen in the ten soils whose mechanical analyses have been given are as follows:—

1	·091%	4	·114%	6	·20%	9	·078%
2	·090	5	·127	7	·19	10	·20
3	·177			8	·248		

Nos. 1 and 2 being the best yielders it is seen how little Nitrogen the rubber tree requires; in fact manurial experiments on No. 1 have shewn further addition of this element to have only a very slight effect, small though the quantity present is.

As analyses have indicated that in producing a crop of 400 lbs. of dry rubber only 3½ lbs. of nitrogen are taken away, it is not to be expected that very general resource to nitrogenous manuring will be necessary. Probably in the near future such treatment will only be required on hillsides damaged by wash and on old tapioca and possibly coffee land.

In no case has any relationship been traced between yield and nitrogen content.

Potash:—The same ten soils may be retained as examples throughout: the following table shews the amounts of potash they contain:—

POTASH.

	Total	Available		Total	Available.
1	·118	·0057	6	1·30	·0073
2	·142	—	7	·376	·009

3	·250	·0084	8	·65	·0096
4	·139	·0052	9	·36	·0086
5	·212	·0092	10	·459	·0081

The quantities present in the clay soils are, as was to be expected, greater. The lowest figure yet obtained for "available" potash is ·004%, and this was from a good yielding estate. No relationship between potash content and fertilization has as yet been traced, and it seems likely that in most types of Malayan soil sufficient is always present for the ordinary needs of the tree. In the prevention of the effects of drought however artificial potash fertilizing is effective even on a soil containing as much as ·015% "available," a phenomenon observed in other countries and with other crops.

Phosphate:—With the exception of the peaty soils, which will be dealt with in connection with coconuts, the soils in Malaya are markely deficient in this element. In those whose other analytical characteristics have been given are found:—

PHOSPHATE. (P_2O_5)

	Total	Available		Total	Available.
1	·023	·0029	6	·069	·0013
2	·059	—	7	·035	·0028
3	·045	·0020	8	·051	·0061
4	·045	·0022	9	·0133	·0020
5	·029	·0033	10	·032	·0029

Phosphate appears in fact to be the limiting factor and in all cases where differences of fertility not ascribable to texture or drainage have been noticed, they have been directly referable to the phosphate content.

Comparing soil 5 for instance with another from the same estate, of which the mechanical analysis is practically the same, which contains as much nitrogen and more potash and yet gives only 300 lbs. per acre in place of the former's 450 lbs. from equally old trees, it is seen that the available phosphate present in the worse yielding soil is only half that in the other (·0017 to ·0033). A field poorer still from the same place contained only ·0012% available.

Still it is not possible to lay down any rule as to the minimum quantity essential for a satisfactory yield as this must depend on the texture. In two soils the amounts of available plant food required to produce an equal effect may be assumed to be inversely proportional to the extent of root development attained by the trees in those soils, other conditions being equal.

Lime:—The hill soils normally contain from ·02 to ·10% of lime, the clay soils ·15 to ·30%. In rare cases only, usually coast soils, is up to 1% found.

Small though these quantities seem, they yet appear to be sufficient, except in the case of acidic peaty lands.

It is by no means proved that liming is necessary on the lighter soils, in fact on No. 1 it has been found to produce very little effect on the yield of the tree. On the clays however it is of benefit in improving the texture; in fact liming is the only measure capable of producing amelioration that has as yet been tried.

Coconut Soils.

Although native owned coconuts are to be found in every part of the country, on all classes of soil, those owned by European companies are, with a few exceptions, to be found on the more or less peaty lands lying along the West Coast. When well drained this soil proves itself admirably adapted to the cultivation; trees begin to fruit as early sometimes as 4 or 4½ years and by their eighth or ninth year are yielding yearly 60 to 80 nuts a tree.

These lands are characterised by being very clayey but containing a considerable quantity of organic matter, rendering them almost black in appearance. They are well supplied with nitrogen, and with potash and phosphate, both in the total and available forms.

Observations go to show that if badly drained they are infertile; but that for coconut the drainage need be less deep and thorough than for rubber.

Instances can be pointed to in which of the two cultivations growing side by side the coconuts are yielding magnificently, the rubber hardly at all.

Inland, the tree seems to prefer a soil of good open texture just as does Hevea, and on the heavy clays yields are poor, 20 to 30 nuts per annum.

The writer has not yet had an opportunity of visiting or examining any of the East Coast soils, on which the tree is reputed to give phenomenal yields when growing apparently out of pure sand. Such very sandy soils as have come under notice have been associated with extremely low yields, unless heavily manured.

The following are examples of some of the best West Coast soils.

MECHANICAL ANALYSES.

	1	2	3	4	5	6
Coarse sand	..	..	..	..	..	..
Fine sand	10·9	9·5	7·7	6·1	20·2	12·1
Silt	25·2	25·4	20·9	22·7	20·8	18·3
Fine silt	35·1	35·5	33·1	39·2	30·9	33·9
Clay	21·4	20·8	30·3	22·8	22·7	32·4
Humus	7·4	8·8	8·0	9·2	5·4	3·3

CHEMICAL ANALYSES.

	1	2	3	4	5	6
Loss on heating	16·4	19·4	13·1	16·0	15·9	10·9
Potash	·334	·224	·555	·29	·407	·345
Phosphate	·0085	·098	·076	·081	·064	·043
Lime	·20	·20	·24	·13	·13	·10
Magnesia	·35	·25	·40	·39	·16	·25
Nitrogen	·38	·446	·23	·463	·279	·174
Available Potash	·0085	·0420	·0196	·0150	·0333	·0347
Available Phosphate	·0223	·058	·043	·022	·0160	·0050

It is not possible to draw comparisons between these soils, owing to different ages of trees etc. Their yielding capacity is probably the maximum attainable.

Where differences of yield do exist they may be ascribed either to different cultivation policies or to variations in the degree of drainage.

It is not improbable that in all these soils the amounts of the various plant foods present are greater than the tree requires for the development of its maximum productivity.

More light on the relationship of soils to yield can be obtained from a study of some inland soils, analytical figures for which are given in the following tables:—

1. Good Soils.

	1	2	3	4	5	6	7
Coarse sand	..	..	..	..	..	..	29·4
Fine sand	69·6	62·4	83·9	73·0	70·0	72·3	38·2
Silt	6·6	6·7	6·3	2·1	4·9	4·1	3·7
Fine silt	7·9	18·2	4·5	11·1	9·4	5·3	7·8
Clay	13·9	11·1	3·8	12·2	14·0	15·3	19·3
Humus	2·0	1·6	1·5	1·6	1·7	2·0	1·6

2. Poor Soils.

	1	2	3	4	5	6
Coarse sand	..	..	..	7·7	26·3	20·7
Fine sand	83·8	91·0	87·8	59·6	36·1	28·1
Silt	3·5	1·6	2·2	6·4	4·3	3·2
Fine silt	5·6	4·9	3·4	11·3	8·2	7·7
Clay	6·2	1·5	5·4	13·7	23·5	39·0
Humus	0·9	1·0	1·2	1·3	1·6	1·3

Except for No. 2 in table II all these soils are seen to be of good texture, and no distinction between the "good" and the "bad" can be drawn. No. 3 of the "good" list for instance contains less clay than Nos. 1 and 3 of the "bad," which might otherwise have had their infertility attributed to lack of this substance.

Reference to chemical considerations must therefore be made to find an explanation for the differences.

The chemical analytical results afforded are seen in the next table:—

MECHANICAL ANALYSES.

1. Good Soils.

	1	2	3	4	5	6	7
Loss on heating	5·8	7·1	3·3	4·4	5·6	4·6	7·1
Potash	·06	·124	·103	·144	·053	·075	·153
Phosphate	·055	·044	·051	·0316	·0335	·059	·0476
Lime	·10	1·2	·09	·04	·08	·04	·02
Magnesia	·04	·03	·02	·05	·06	·05	·03
Nitrogen	·098	·080	·077	·080	·085	·10	·078
Available Potash	·0065	·0191	·0122	—	·0097	·0100	·0084
Available Phosphate	·0114	·0073	·0085	·0135	·0110	·0098	·0029

2. Bad Soils.

Loss on heating	2·3	2·5	3·3	4·1	7·7	9·8
Potash	·033	·021	·017	·140	·144	·128
Phosphate	·0087	·0086	·016	·029	·029	·0356
Lime	·02	·05	·17	·018	·02	·02
Magnesia	·10	·05	·20	·02	·02	·02
Nitrogen	·045	·062	·06	·06	·076	·068
Available Potash	·0020	·0043	·0042	·0500	·0080	·0073
Available phosphate	·0017	·0017	·0011	·0053	·0016	·0017

The first three of the latter series are probably deficient in all the plant food constituents, nitrogen, potash, and phosphate. On No. 1 are old trees yielding only a few nuts a year. No. 4 is well supplied with phosphate and potash but lacking in nitrogen; it has yielded during the past three years an average of 24 nuts per tree only. The average for No. 5 for the same period is 40 nuts;

this soil contains very little available phosphate, as also does No. 6, the average for which is 30 nuts per tree.

The soil in the first list are all excellent yielders, the trees giving 70 to 80 nuts a year. No. 3 in fact, which is manured regularly with cowdung, is stated to yield 100 nuts a tree. This soil is from a small native holding. None of these soils contain much nitrogen, the percentage being about the same as seemed sufficient in the case of rubber.

Potash and phosphate are present in all in good amounts. Soil No. 7 however in which the available quantity of the latter substance is less than in the others has for several years been showing a constantly diminishing yield, which has dropped from 80 nuts to 50.

Manuring coconut trees with salt is a very common practice amongst most Eastern races, and probably originated in the observation that trees planted by the sea so often do well. Although salt is not a necessity—many inland plantations to which it is never applied give high yields—it is undoubtedly in many cases beneficial. Probably its action is to increase in the soil the amount of "available" potash.

A much disputed point amongst coconut cultivators is whether to clean weed or to allow grass to grow. The writer's observations have led him to the conclusion that the latter practice is unsound; probably on the account of the formation of toxins, as demonstarted at Woburn and other places. On the other hand clean weeding has its disadvantages—the soil gets baked and loses its humus more quickly and on slopes loss results from wash.

A better practice would be to grow a leguminous cover crop, to be fed to cattle or turned in at the commencement of the dry season. The coconut tree suffers severely in times of drought and a timely mulch may have an effect of great importance on the ensuing season's yield.

An important feature about a coconut plantation is that the growing of such a crop is at all times possible. With rubber on the other hand after about the fourth year the shade is too dense to permit of anything being interplanted.

Soil Amelioration.

In the case of both cultivations the least suitable soils, and the ones most difficult to deal with, are the heavy clays that have been described.

Liming is one method of treatment, for the purpose of flocculating the clay particles and thus lightening and making more porous the texture. Lime however is in Malaya very expensive,

costing nearly £2. per ton; for the above purpose a large quantity is required, and altogether it is doubtful whether the results would justify the expenditure.

The other method of improving such a soil is by green manuring. This must however be started in the early days, when the trees are young, as only when light has free access to it can a cover crop be grown. No suitable plant that will grow in the shade has as yet been found. The seed should be sown at the commencement of the wet season, in September or October, and the crop forked in deeply about the following February. A second sowing might be possible in May, but one crop a year should be sufficient. Repeating this for three seasons, or as long as the shade is not too dense, will result in a large quantity of humus having been incorporated with the soil, rendering the texture lighter and more pervious, beside increasing the nitrogen content. A suggestion that seems well worth a trial is to dig narrow trenches three feet deep between the trees, and to bury cowdung, or, as this is rarely obtainable, a green manure, best together with some basic slag, in them, finally lightly replacing the soil. These places, to which the young rootlets will rapidly be attracted, will serve as ventilating shafts, and should have a beneficial effect on the health of the tree.

Another serious question is that of the prevention of wash. It is not uncommon to see numerous deep furrows cut by the rain water running down the sides of hills planted with rubber from which the surface soil is obviously being rapidly eaten away. Here again a cover crop will prove of great value; but the best preventive undoubtedly is to terrace.

The high cost is the argument used against this operation; but those who have carried it out hold the opinion that this will be adequately compensated for by the greater rate with which the coolies will be able to tap when the trees come into bearing.

PRELIMINARY LIST OF INSECTS COLLECTED IN THE FEDERATED MALAY STATES.

BY C. B. HOLMAN HUNT.

(Continued.)

The following Carabid was omitted from the list last month.

Pheropsophus occipitalis, var, McLeay, Batu Caves, Selangor. Plains.
And the name of the first Lucanid on the List should be castlenaudi and not castlenaui.

Dytiscidae.

Cybister tripunctatus, Oliv.		Plains.
Hydaticus vittatus, Fab.		Plains.

Hydrophilidae.

Sternolophus nr. rufipes, Fab.		Plains.

Staphylinidae.

*Philonthus fimetanus, Gravely.		Plains.
*Philonthus sp.		Plains.
Paederus fuscipes, Curt.	Parit Buntar, Perak.	Plains.
Lathrobium sp.		Plains.

Nitidulidae.

Carpophilus foveocollis, Murn.	Caledonia Est. Prov. Wellesley.	Plains.
Amphicrossus disclor, Erich.		Plains.
*Brachypeplus between { orientalis, Musc. / obesus, Grom.	Caledonia Est. Prov. Wellesley.	Plains.

Cucujidae.

Silvanus nr. unidentatus, Fab.		Plains.
Laemophlaeas pusillus, Schon.		Plains.

Erotylidae.

Tetralanguria elongata, Fab.	K. Lumpur, Selangor.	Plains.
Tetralanguria elongata, var.	Maxwell's Hill, Perak.	3400 feet.
Episcapha 4-maculata, Wiede.		Plains.
Aulacocheilus janthinus, Lacard.	Batu Tiga, Selangor.	Plains.
*Pseudotritoma, sp.		Plains.

Coccinellidae.

Alesia discolor, Fab.	Parit Buntar, Perak.	Plains.
Coccinella transversalis, Fab.		Plains.
Chilomenes 6-maculata, Fab.		Plains.
*Ithone 12-spilota, Hope.	Maxwell's Hill, Perak.	3400 feet.
Caelophora bisellata, Muls.		Plains.
Caelophora inaequalis, Fab.	K. Lumpur, Selangor.	Plains.
Neda 16-notata, Fab.	Maxwell's Hill, Perak.	3400 feet.
Chilocorus nigritus, Fab.		Plains.
Scymnus sp.		Plains.
Epilachna indica, Muls.	Butu Tiga, Selangor.	Plains.

Endomychidae.

*New genus (nr. Mycetina ?)		Plains.
*Pdanus gerstaeckeri, Gorh.		Plains.
Stenotarsus pantheiinus, Gorh.		Plains.

Byrrhidae.

*New genus. Very interesting, with lobed tarsi.		Plains.

MALACODERMIDAE subfamily. ?

Prionocerus sanguinea, Schaus.		Plains.

LYCIDES.

*Trichalus niger, Waterh.		Plains.
*Trichalus communis, Waterh.	Batu Tiga, Selangor.	Plains.
*Cantires nr. congener, Waterh.	Batu Tiga, Selangor.	Plains.
*Metanaeus dispar, Waterh.	Batu Tiga, Selangor.	Plains.
*Ditoneces sp.		Plains.
Taphes between { brevicollis, Waterh. / frontalis, Waterh.	Batu Tiga, Selangor.	Plains.
*Micronychus nr. vestitus Waterh.		Plains.
Genus ?		Plains.

LAMPYRIDES.

Pyrocoelia terminata, Gorh.	Batu Caves, Selangor.	Plains.
Pyrocoelia ?	Maxwell's Hill, Perak.	3400 feet.
Luciola pallescens, Gorh.	Gap, Selangor-Pahang.	Plains.

TELEPHORIDES.

This family is in course of arrangement at the British Museum and, although 12 different species were recognised as different in the Malayan collection, only one was identified, namely:

Ichthyurus pachygaster, Gestr.	Bukit Kutu, Selangor.	3300 feet.

MELYRIDAE.

*Attalus sp.	Parit Buntar, Perak.	Plains.
*Genus nr. Carphurus.		Plains.

CLERIDAE.

*Tenerus between { siamensis, Gorh. / melanurus, Gorh.		Plains.
Clerus cicindeloides, Gray.		Plains.
*Calimerus sp.		Plains.

LYMEXYLONIDAE.

*Attractocerus emarginatus, Castlen.	Maxwell's Hill, Perak.	3400 feet.

DASCILLIDAE.

*Lichas sp.		Plains.

EUCNEMIDES.

*Trixagus sp.		Plains.
Hodoceras malaisiensis, Bonv.	Batu Tiga, Selangor.	Plains.

ELATERIDES.

Alaus lacteus, Fab.	Riverside Est. Selangor.	Plains.
Alaus putridus, Cand.		Plains.
Alaus lophura, Cand.		Plains.

Anathesis laconoides, Cand.	Batu Tiga, Selangor.	Plains.
*Megapenthes ebriolus ? Cand.	Gap, Selangor-Pahang.	2700 feet.
Megapenthes biloesus, Cand.		Plains.
*Diploconus carneus, Cand.		Plains.
*Diploconus carneus, black var.	Batu Tiga. Selangor.	Plains.
*Melanotus nr. cuneolus, Cand.		Plains.
Hemiops crassa, Gyll.		Plains.
Elias umbilicatus, Cand.	Bukit Kutu, Selangor.	3300 feet.

BUPRESTIDAE.

Catoxantha opulenta, Gory.	Batu Caves, Selangor.	Plains.
Cyphogastra ventricosa, Oliv.		Plains.
Chrysobothris ellyptica, Deyr.		Plains.
Iridotaenia mirabilis, Sap & Gory.		Plains.

TENEBRIONIDAE.

Setenis coracina. Knoch.		Plains.
Setenis semisulcata. Burm.	Kuala Lumpur, Selangor.	Plains.
Setenis impressa. Burm.	Riverside Est. Selangor.	Plains.
Encyalesthes ?	Batu Tiga, Selangor.	Plains.
Camaremena ? or Strongylium ?	Bukit Kutu, Selangor.	3300 feet.
Anthracias gazellae, Fab.	Batu Tiga, Selangor.	Plains.
Charyotheca sp.	Batu Caves, Selangor.	Plains.
Platydema sp.		Plains.
Platydema nr. scriptipenne, Fairm.		Plains.
Amarygmus sp.		Plains.
Artactes marginicollis, Fairm.		Plains.
Leiochrinus rufofulvus. Westw.		Plains.

CISTELIDAE.

Cistelomorpha calida	Gap, Selangor-Pahang	2700 feet.
Allecula sp.		Plains.

LAGRIIDAE.

*Lagria sp.	Bukit Kutu, Selangor.	Plains.
*Lagria sp.	Batu Tiga, Selangor.	Plains.
*Casnonidia sp.		Plains.

OTHNIIDAE.

Othnius between {delusus Pasc. / lynceus, Pasc.}		Plains.

ANTHICIDAE.

Leptaleus trigibber, Mars.		Plains.

OEDEMERIDAE.

Genus near Oncomera.	Gap, Selangor-Pahang.	2700 feet.
Genus near Oncomera.	Maxwell's Hill, Perak.	3400 feet.
Genus near Sessinia.	Maxwell's Hill, Perak.	3400 feet.

MORDELLIDAE.

Mordella composita, Walher.		Plains.
Mordella sp.		Plains.
Mordella sp.	Batu Tiga, Selangor.	Plains.
Mordella sp.	Batu Tiga, Selangor.	Plains.
Mordella sp.	Batu Tiga, Selangor.	Plains.

CANTHARIDAE.

Epicauta ruficeps, Illig.		Plains.
Zonitis straminea var, Fairm.	Gap, Selangor-Pahang.	2700 feet.
Zonitis sp.	Gap, Selangor-Pahang.	2700 feet.

(To be continued.)

DEPARTMENT NOTES.

Mr. J. Grantham has been appointed as 3rd Assistant Agricultural Chemist, Department of Agriculture F. M. S., Kuala Lumpur.

FEDERATED MALAY STATES.

Comparative Statement of Cultivated Rubber Exported, with Value and Duty Collected Thereon, during the Years 1914 and 1913.

Destination.	Exported during April, 1914.	Previously.	Total export during the year.	Export during similar period of previous year.	Increase.	Decrease.	Value of rubber exported, 1914.	Duty collected, 1914, to date.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons,	$	$ c.
Straits Settlements ...	1,127.50	4,989.76	6,117.26	3,472.67	2,644.59	...	10,955,712	272,279.81
United Kingdom ...	795.25	3,678.02	4,473.27	4,221.78	251.49	...	8,113,240	202,831.00
Continent of Europe ...	97.73	443.02	540.75	527.75	13.00	...	997,548	24,938.70
Ceylon	48.07	264.18	312.25	255.21	57.04	...	349,907	8,747.67
Other Countries ...	...	100.27	100.27	...	100.27	...	413,498	10,337.45
Total ...	2,068.55	9,475.25	11,543.80	8,477.41	3,066.39	...	20,829,905	519,134.63

KUALA LUMPUR,
6th June, 1914.

H. W. FIRMSTONE,
Acting Commissioner, Trade and Customs, F.M.S

Abstract of Meteorological Readings in the various Districts of Malaya for the Month of May, 1914.

DISTRICT.	Mean Barometrical Pressure at 32° Fah.	Maximum in Sun.	TEMPERATURE.				HYGROMETER.				Prevailing Direction of Winds.	Total Rainfall.	Greatest Rainfall during 24 hours.
			Mean Dry Bulb.	Maximum.	Minimum.	Range.	Mean Wet Bulb.	Vapour Tension.	Dew Point.	Humidity.			
Kelantan, Kota Bahru	...	149.	84.1	93.83	75.38	18.45	79.1	.891	75.8	.76%	...	3.35	1.17
Malacca, Durian Daun Hos.	29.863	152.5	84.4	89.9	72.6	17.3	81.	.999	...	.85	N.	1.99	.45
N. Sembilan, Dist. Hospital Seremban	...	149.6	81.	90.4	72.6	17.8	76.5	.831	73.6	.78	N.W.	4.52	1.12
,, Dist. Hos. K. Pilah	...	155.	83.	...	...	...	79.2	.927	76.7	.81	...	2.35	.80
,, ,, Tampin	...	146.5	83.4	...	...	...	77.6	.840	73.9	.74	...	2.91	.63
,, ,, P. Dickson	...	162.5	85.1	90.5	76.4	14.1	79.2	.883	75.4	.73	...	2.09	1.06
Pahang, ,, K. Lipis	...	...	83.5	92.2	72.9	19.3	76.9	...	...	...	...	4.49	1.65
Penang, ,, Penang	29.849	145.4	84 9	91.2	74 5	16.7	78.9	.908	72.5	.75	...	7.36	1.71
Perak, ,, Taiping	...	110.	83.89	96.	67.	29.	78.29	.891	...	.77	...	6.47	3.67
,, ,, Ipoh	...	...	84.33	96.	71.	25.	78.14	.881	...	.75	...	3.40	1.74
,, ,, T. Anson	...	...	83.53	95.	72.	23.	79.26	.942	...	.83	...	8.50	1.80
,, ,, P. Buntar	...	...	84.18	95.	73.	22.	78.74	.910	...	.79	...	8.82	3.80
,, The Cottage	...	...	...	...	...	...	...	...	...	...	...	5.44	1.13
Selangor, General Hospital Kuala Lumpur	...	122.1	81.4	90.5	70.8	19.7	78.1	.895	75.8	.83	...	2.19	.59
,, Dist. Hos. Klang	...	...	83.6	90.7	76.3	14.4	79.1	...	...	...	...	7.66	2.32
,, ,, K. Selangor	...	...	...	89.1	75.7	13.4	...	...	...	...	...	1.49	.56
,, ,, Rawang	...	...	...	93.1	73.5	19.6	...	...	...	...	...	2.47	.72
Singapore, Kandang Kerbau Observatory	29.883	160.	85.6	97.	73.	24.	78.3	.932	...	77.	S.E.	2.74	.86